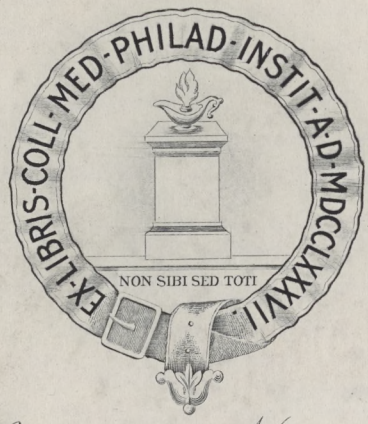

William M:Williams's

1777

# Anatomical Lectures

Taken from Doct.r W.m Shippen Professor of Anatomy in the College of the City of Philadelphia ... Lecture the 1.st

## Introductory Lecture.

Anatomy in the Greek Language signifies cutting and was confined by the Antients merely to the Art of examining Bodies by Desection the Moderns use it in a more Compound and large sence.

It is divided into Human & Comparative, tho the latter is to be introduced only when the Parts serve to illustrate those of the Human Body. Monsters are also useful for Anatomical Inquiries, as they frequently serve to throw some new light upon the Works of Nature.

Anatomy has been applied to the Vegitable & Mineral Kingdoms and from thence many curious Observations have been collected. This Science has undergone many Revolutions and tho its rise was probably very early, yet its progress was very slow. It cannot be said to have any precise Beginning, nor was it brought to light by Chance, by the Genius or Sagacity of any particular Man. The first Man that lived must have some knowledge of the Bones, Ligaments and other made parts which has been gradually improved. The intercourse of the Sexs curing Wounds & in short self-Love & Preservation added somethi continually to the Stock of Anatomical Learning. The

# Introductory Lecture

The formation of many of the parts of Brutes & of Human Bodies were known to bear a great resemblance: the Priest & the Butcher but more especially the Philosopher must be supposed to be well acquainted with the inward Viscera: for the practice of slaying and feeding on Animal food was very early. Hypocrates distinguished Physick & Surgery into two distinct professions and was the first who ever wrote any Treatise on the subject of Anatomy. The knowledge of the Antients has been very much extolled by some who greedily swallow every thing that has been said by them, but this seems to arise from prejudice in those who have been conversant with their Works, or from a design to decry the discoverys of the Moderns. All Hypocrates's discoveries of Anatomy are very imperfect, if we extract the Bones, & as he says he once seen a human Skeliton we may readily suppose that he was better acquainted with Osteology than any other part of the Science. He lived 460 years before Christ & Galen the great Commentator on his Works florished about the 190th Year of the Christian Æra. Between Hypocrates & Galen, Hyerophylos & Eristratus deserve great praise, for their skilful proof in Anatomy. They taught this Science in the famous School of Alexandria, to which the Greeks resorted to finish their Education. Hyerophylos alone is said to have dissected 700 Bodies. He likewise opned living Bodies of Criminals, which tho it was a cruel practice, yet it was not altogether to be discommended, for it shews how anxious he was after new discoveries. But as this Barbarity could

not

Not but be very shocking as it was of great disservice to Anatomy. Galen applied himself diligently to Anatomy & Studied at Alexandria where he formed a good System. Anatomy was daily advancing till it met with a great check at the Division of the Roman Empire and about the fifth Century over all Europe. In 640 the Saracens made themselves Masters of Alexandria & burnt the famous Library. A Catastrophe which can never be enough regretted. But the Caliphs at last being satiated with conquests gave Encouragement to Learning and the liberal Arts, and the school of Alexandria was revived a gain & the Learning of the Greeks was transfer to the Arabians. The Arbs discected but little & contented themselves with Translating & Commenting on the Works of Others but chiefly on the Works of Galen. In 711. Anatomy was introduced in Spain & learning then began to be distinguished. But in 1453 the Turks sacked Constantinople & exercised the same Barbarities as had been practised by the Savage Arabs in Alexandria But this went which was thought would put a final period to learning, was the very means of extending it for the Greeks fled into Italy & Benedictus Amasia & Carpenses &. made some discoveries in Anatomy by their own dissections. In 1540 Vesalius arose who was a Man of great parts with equal Ambition. He studied laboriously and was indefatigable in Anatomy at 28 years of age he published a large Work. As

# Introductory Lecture

As Galen had applied himself to comparative Anatomy chiefly, & had taken many of his observations from the dissections of Brutes. Vesalius had frequent occasions to blame & contradict his Works, which in so young a Man was looked upon a kind of presumption. & his Cotemporaries Silvius, Colombus, Fallopius and Eustachius, all endeavoured to run him down & indeed they detected him in the same errors which he had so highly condemned in Galen. In Vesalius's time Anatomy was Improved that it was doubted whether it could be carried farther. But in the year 1628. the Circulation of the Blood by the great Doct.r Harvey. tho' he had made the discovery 10 Years before that time in his lectures which he gave at the College of Physicians. the advantages of this discovery has been great. as has been the Means of producing many more. as it furnished us with a New Method of investigating Diseases, and unravelled many things which until then were inexplicable. We may justly say of Doct.r Harvey that he was Sagacious & a Man of great penetration, and at the same time indefatigable in his researches, & that his many other improvements ought to have acquired him greater Honours than the Circulation. For if a few obvious truths had been taken into consideration & prejudices laid aside. if the Effects of Bloodletting Bandages & other Circumstances of this Nature. had been properly Attended to,

we

we shall wonder it remained so long a Mistery. There are many things of which we still remain ignorant. and its probable that such a Subject as the Human Body will always afford a large field to exercise the Understanding. The passages of the Chyle into the Blood by the Lacteals, was soon after found out by Asellius and the Thoracic Duct by Peguet. The Circulation between Mother and Fœtus was begun by Harvey in his Book de Generatione Animalium, and was compleated by Swammerdam Vanhorn or De Graff. for they all lay claim to it. They say that every Woman hath a Cluster of Eggs, one of which is impregnated with the Male Seed. so that the Egg is nothing but a proper Nidus for its reception; and from hence they argued for the similarity of Generation of Viviparous & Oviparous Animals. Leuwinhook Solicitous of Accuracy in his Discoveries, was the first that made use of Microscopes, & he carried them so far that what appeared to the naked eye a rude Mass appeared thro' his Glasses a wonderful piece of Mechanism. and he pertended to see even the Animalcules swiming about like so many Tadpoles in the Male Seed. he supposed that the Animal (this so small that he computed that 3,000,000,000, of them are not equal to a grain of Sand, whose Diameter is equal to 1000 of an Inch) existed intire from the beginning: and from the great Analogy that this Doctrine bears to the Vegitation or Generation of Plants, from the Newness of the Discovery, and the Air of

Truth

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Truth which it seems to carry with it this became the General prevailing Opinion, till within these few Years, and was Called Systima Vasculare.

Reyesh about the same time invented the Art of Injecting and filled the Vascular System with Colour'd Wax. This gave the hint that the Animal Body was an Hydraulic Machine & he found Means to pre: serve Animal Substances, and was the first that wet and Dry preparations, which in Anatomical Study is of great use as it preserves diseased parts which are extraordenary in their Structure or such as would take a long time to prepare. From these Discoveries the present Anatomes to have many advantages over the Antients, who seem to be excelled by the Moderns in no one particular as in that of Anatomy. Among other inducements to the Study of this Science in this Age is the frequency of Subjects. We may add that hardly any one hath applied dilig. ently to Anatomy without making some improvement or discovery in it or at least Making himself Master of all the parts of the Human Body.

Yet notwithstanding Anatomy has been so much encourag'd it is remarkable that no great Discovery has been made these last 40 or 50 years, & the Modern Anatomists are as much at a loss to account for the Use & Structure of the Brain & Nerves as the Antients were for that of the Heart & Arteries

Lect. 1st What shall we then say? is the Subject exhausted? no!
nor would it become us to sit down tamely with what we
know & say our Faculties are limited. There is all the reason
in the World to imagine we are ignorant of much more than
what we know. There is still a large Field left for us to
improve in, & as an incitement to our Industry in enquiring
it will not be amiss to remember that many things now
plain & obvious were heretofore inexplicable, it seems
strange that Anatomy should be confined to a single
Profession, especially as it is a Study that bids fair to
bring the greatest advantages to Mankind. Want of Subjects,
& the aversion Men have to dissecting Bodies, seem to have
been the most probable Causes; few can at first bear to
look at them with any degree of composure. Anatomy is
an amazing Field for Speculation, Fontinella observes
that Anatomy & Astronomy present us with the greatest
Attributes of the Divinity; in one we behold his
immensity in the magnificent Structure of the
Heavenly Bodies, in the other, his amazing Wisdom in the
wonderful machination of our animal Body, which shews
its divine Maker in a most convincing Manner. The human
Body by the Antients, was called Microcosmus, as
being an Epitome of every thing that was curious in the
World, & had many whimsical conceits about it.
Galen tells us, that he design'd his piece de Usu
Partium

# Introductory Lecture.

Partium, as a Hymn to the Creator, & has given such proof of his knowledge, that it is this day regarded as a Masterly performance. Cicero likewise dwells much on the Structure of the Human Frame when he endeavours to prove the Existency of a Deity, from the Order of the Universe.

The immediate purposes of Anatomy concern those who study Physick. Hypochrates says the Knowledge of the Constitution is the first part of Medical Inquiry. As most of Actions are merely Mechanical, if the Human was endow'd with sufficient Sagacity to discover the perfect Structure of the Body & true Nature of the Animal Oeconomy, we might probably cure Diseases even in Embryo; but this we must not expect to attain. Health & Disease are the opposite to each other, therefore unless the State of the Body in health is known, we cannot understand when it is diseased, hence Eristratius and Herophilus open'd living Bodies. The opinion of the Empirick is, that little knowledge in Anatomy is sufficient, but from the Testimony of Hippocrates, Galen, Celsus, Friend, Pitcarin, Sydenham

# Introductory Lecture.



Sydenham, Harvey, Hoffman, Boerhave, Mead, & all the greatest authors, the excellency of it is confessed, & the greatest intimacy of the human Frame is recommended. Sydenham compares a Physician who is ignorant of Anatomy to a Sailor who does not know his Compass. In short Anatomy is of such importance in Physic that all our best Physicians have either wrote upon it or taught it.

Nor is the Knowledge of Anatomy, less necessary in Surgery. Its advantages are very evident: for all Improvements in modern Surgery, have arose from our more intimate knowledge of Anatomy, & by frequently dissecting dead Bodies, we inform the Head, give dexterity to the Hand, & insure the success of Operations on living Bodies. Besides these dissections inform us where we can cut with safety in the living Body, & they instill into us a sort of inhumanity necessary for a proper use of the knife upon our Fellow Creatures. Surgery, in the Hands of a skilful Anatomist, is a useful, salutary and divine Art, but practised by the Ignorant, is barbarity & even Criminal. To continue Master of any Art, we must have frequent recourse to it, attending Anatomical Lectures is reading the Book of Nature. The Reader does not make

make the Subject, but prepares it, & helps to fix the attention of the Audience. Hence it is of Service even to Physicians & Surgeons in Practice, to refresh their Memories now & then by a course of dissecting Bodies. It may be asked to what purpose such a variety of Parts of the Human body? why a more simple, less delicate & less expensive Frame might not have answer'd as well? to answer this, let any one in his Imagination make a Man, & suppose the immaterial Parts or Mind, is to be so placed in a Corporeal Body as to be Necessitated to converse or have intercourse with other material Beings. Let him weigh this, & he will be convinced that such a variety of Organs were absolutely necessary to compleat such a Machine, & examine what he will need for his accomodations. They will appear to be as follows, viz. 1st he will require proper Organs for receiving outward Impressions & different Sensations, hence were the Senses given, as the Eye, Ear, Nose &c. 2dly the Mind must be supplied with Organs of Sense, hence the Nerves were erected, which take their use from the Brain, or Seat of the Mind to carry out

out & return Sensations to the Brain, & to be the Occasional Monitors. And as man is made for a sociable Animal, that he might communicate his Thoughts, he was endowed with a Faculty of Speech. That Man might turn from Place to Place, that he may turn to various Objects, pursue some, shun others &c. Limbs were given him, which are cloathed with Muscles & Tendons proper for such Motions; but to give Shape, defend, strengthen & support the Body, Bones are provided; to which, being a stiff riged Column, they are many in Number, but then it is necessary such should be connected together with sufficient Strength, & yet admit of sufficient pleability in the Joints; hence Ligaments are made use of. But as the hard unequal Substances of the Bones, would by rubbing on each other, wear down & render motion extremely difficult & uneasy, the Ends of the Bones in the moveable Joints, are tipped with Cartilages & the Joint supplied with a proper lubricating Mucous to keep them always moist & slippery. And Lastly, the whole is wrapped up in a adipose & cellular Membranes, & the common Integuments as the Skin &c. As all Bodies must have their Particles abraided by constant Motion, it was necessary for the Machine to have Organs to repair

Waste;

Waste; hence the Blood, loaded with nutritious & healing Particles, is carried from the Heart to all parts of the Body. The Blood is carried from the Heart by the Arteries, & returned by the Veins when impoverish'd, to be impregnated with fresh Matter or Nourishment. As some Parts become superfluous or excrementitious, Glands are provided to strain & depurate the noxious Particles of Blood, as well as for the secretion of particular Juices; and when the secreted Juice has answered its purposes, the excretory Duct carries it off; hence an uninterrupted circulation is carried on to supply the deficiencies & to keep the Blood in a proper State of Fluidity, so as not to coagulate. But prior to the Blood, we must have all the apparatus for digestion, as the Mouth, Teeth, Throat, Stomach, Gasterick & Enteriek Liquors &c. to prepare the Rudiments of the Blood. The Ingesta have past the Organs of Digestion, the finer & nutritious Part are absorb'd by the Lacteals & carried by the Thoracic Duct to be mixed with the impoverish'd Blood, & with it to form a fresh Supply, whilst the grosser Parts of the Blood are carried down the intestinal Canal &

and thrown out of the Body.

The circulation in the smaller Vessels must be languid & slow; & hence the Blood will be returned thicker, to remedy which, the Lungs were constructed, to churn, break down & liquify the returning Blood. But as too much heat would have been injurious, the Organs of Respiration, cool & attemperate the heat arising from the rapid Motion of the Blood through the Lungs. We have now a pretty compleat Animal, which may not improperly, be compared to a hydraulic machine, the whole being tubular & filled with a circulating Fluid; but its duration is limited, & its decay is like its growth, gradual. It may be asked, seeing the Body is thus supplied with continual Nourishment &c. Why does it not go on continually to encrease? & why it should stop at such a growth? Beside the infinite number of Reasons which could be assigned, Why the All-wise Creator has order'd it otherwise, there is this which arises from the very Action of Life itself. The circulation itself effects this, by turning the Fluids into Solids; by giving firmness & resistance to the adjoining Parts, hence increasing the Solids & diminishing the quantity of Fluids. The Body grows &

by degrees until it arises at a certain Magnitude, by which time the Solids have obtained such a force as to push on the fluids with a greater momentum; this checks the growth, for the sides of the Vessels having acquired strength of resistance will admit of no further enlargement for being distended with the fluids a vigorous circulation compressing the small Vessels, & the dense, nutritious Particles of the Blood stopping small Cavities daily.

The duration of the Animal Being thus limited, that the Species might be preserved, Providence to put the finishing Hand to this Work, has endowed each Sex with Organs of Generation, & given them Appetites which strongly impel them to the Enjoyment of each other to propagate their Species.

The method generally practised in Anatomical Lectures is either the Analytic or Synthetic. The Analytic is when we take down & examine the general Parts till we arive at the most simple. The Synthetic is when we begin with the most simple & rise gradually to the most compound Parts; & this method of having is to be preferred: hence some have begun their Demonstrations from a Fibre, Membrane

Membrane &c. Many follow the Analytic Method of investigation, but when both are combined, one supplies the Deficiences of the other. The Body considerd as a simple hydraulic Machine subjects us to a double inquiry concerning the Structure of the Parts & concerning the Laws of their Motion: The former Anatomy, the latter Physiology or the Animal Economy. The Doctrine of the Solids & the Fluids were divided by the Antients into two Classes & this was their first Division; the Solids were again divided into Similar & Dissimilar; the Similar, the Sea & the Dissimilar part: they were again divided into Spermetic & Sanguinary too, the Muscles Sanguinary, & the Tendons, Nerves &c. the Spermetic. They were divided also into Organic & Inorganic. But by the Solids are divided into hard & soft, viz. Osteology & Sarcology: Sarcology is again divided into Myology, Splanchnology, Neurology, Angiology & Adenology or the doctrine of the Glands. There are three Species of Solids of intermediate Nature, as Cartilages or Gristle, Hair & Nails; the first is generally classed with the Bones, the latter with the Intiguments.

Fluids are divided into three Species, as Crude, viz. Chyle

Chyle, which is that Fluid recently taken into the Bowels, & not yet thouroughly incorporated with the Blood, or what we absorbe by the surface of the Body: Secondly, into the perfect & ripe, as the Blood fully concocted; Thirdly, the depurated, or these strain'd off from the Blood by the Secretions, some of which are excrementitious; others not so, but are to be reconveyed to the Blood, as the Bile, Pancreatic Juice, Saliva &c. which are all subservient to Digestion.

Whoever is desirous of being a good Anatomist ought to take nothing on supposition, but to see every thing, & above all to dissect himself, & then what he gains that way, will not only be lasting but unerring Knowledge. A Man ought to take all his Ideas, particularly his first impressions, from the fresh Subjects rather than even from the best Preparations. Dr. Hunter says, "Students "should never read till they have seen some "Dissections." by this means wrong Notions are prevented. By means of Preparations, we can preserve things uncommon & but seldom to be met with & such as require much time and

Labour

Labour to dissect & unravel the Parts; as the pregnant Uterus, Fœtus &c. or preternatural Organizations of any Parts. Preparations are further useful to shew the minutiæ of Anatomy, as the Ear, Eye &c.

There are two methods of preserving Parts, one by means of Spirits, the other by drying them & giving them a Varnish. Both have some Advantages; but the Wet seems most preferable, tho' wet preperations, by keeping, will loose both their Colour & Transparency: and tho' the dry have their Use, yet they will not retain their natural Form or Size, except the Bones only. Professors are generally too fond of Preparations & reject the fresh Subject too much. But we must remember that Preparations should not be used as Substitutes, but as Supplements to the Body, always making some allowance for their Apacity &c.

As to Physiology, every Plan hitherto offered, has so much to be alledged against it, that it is doubtful which Method is the properest to follow. Physiology is properly incorporated with Anatomy & is prope to enliven the Subject, & make the impressions stronger Whoever makes the Body his particular Study, is certainly

# Introductory Lecture.

certainly the most proper Person to explain its functions, & to detect false Reasoning; But all the Actions are not to be explained & therefore not to be attempted, as the Structure of the parts will not always correspond with imaginary Uses. Physiology like the Body, has neither beginning nor end. The Body is compard by Hippocrates, to a Circle, for if you begin with the Brain, you will find the Heart necessary to be known, & vice versa & so of the other parts. Books on the Subject of Physiology may be read to Advantage, but Anatomical Books should by no means be studied before we become tolerably acquainted with the Parts from the Book of Nature. Indifferint demonstrations are better & more useful than the most accurate descriptions & figures. The Order to be observed in the Course, is first to premise a general Account of the Structure of the Parts, together with the most obvious Phenomina, & to take notice of the most prevailing Opinions concerning them, & the Arguments in support of those Opinions, & then leave all to judge for themselves, viz. of the nature of the Blood Vessels, Nerves,

Nerves, Glands, Cellular Membrane, Muscles &c. Then proceed to the Skeleton in particular, next the Muscles & Organs of Generation proper to each Sex, then the Viscera, then a Child dissected to shew the Blood Vessels & another to shew the Nerves; then a Fœtus, & Lastly a Body for the Operations of Surgery & for the Bandage. Anatomists generally begin with the Bones, because they are not so dependant upon the other Parts: But the first Question will be, What is a Bone? Why it is made up of twenty things we know nothing of yet, & so of any other part. Introductory Lectures are necessary, they were thought of by Nichols first, & approved & continued by Hunter; it being requisite that one should have all the Terms of Art explained. An acquaintance with the Science is necessary to make a Man a compleat Physiologist & Anatomist. When a Man thoroughly understands Anatomy, Chymistry, & Philosophy, he may learn Physiology from Books, & will be able then to judge for himself & explode the Errors in them. The best Anatomical Books for young Students, are judicious Compendiums chiefly,

as

as those do not overburthen & perplex the Memory.
Kiel is very concise, but incorrect, Heister's compendium is fuller & more exact, & is one of the best. Cheselden has the Advantage of good Figures & frequent Chirurgical remarks. Winslow, is the best system of all, but dry to a Learner, being all Anatomical without mixture of Physiology. For the description of particular parts, Monro's Osteology & Neurology, Douglass on the Muscles. For Figures Eustachius is the most correct & may be reckoned one of the best performances. Vesalius's are very good, but not so natural as Cowper. Cowper's are all taken from Nature & finely executed, but somewhat indistinct. Albinus is good on the Skeleton & Muscles. For Physiology Boerhave's Institutes. tho' Fleming's Physiology is plainer & more concise, but Haller's Physiology is doubtless the best extant.

## Lecture 2:

If we were to treat of the gross Parts only, we must begin with the Bones, then proceed to the Muscles, Nerves &c. but as we are to enquire into the particular

particular Texture of the different Parts which are composed of heterogeniour Qualities, we must begin our Inquiries with the more minute Parts, their general Natures & Properties. The Parts are first to be considered in a general Way. But the Fluids, which the Vessels carry, seem to be the most proper to begin with, then we may go on to the similar parts.

## Of the Blood.

The Blood is said in Scripture to be the Life of the Animal, & Dr. Harvey has a curious Chapter concerning it in that Sense; he thinks it the part in which the Soul resides, that it is the first that lives & the last that dies. He imagines also that the first motion is in the Blood, & that it throws the Solids into Action. Haller agrees with him in this particular, & it has been looked upon in all Ages as the immediate Seat of Life. Haller thinks that the Heart moves before the Blood is red, he considers the Animi as the Principle & the Blood as the Instrument, by which all the Functions of the Body are performed. The Blood in human Bodies is naturally red but not

necessarily

# Of the Blood.

necessarily so, for in smaller Animals it is not so. It is a little saltish to the Taste, not homogenous, a gummy, aqueous Fluid & for the greatest part mixes with Water. Its specific gravity is greater than Water, Boyle computes it as 1041. to 1000, Jurin & Martin 1054. Blood is made up of a variety of Parts, & we must imagine a from our Diet, tho' this is not conclusive: the Secretions that come from the Blood are very different, as Wax, Bile &c. The Blood examined by Microscopes, by Chymistry, & by attending to what happens when taken out of the Body & mixed with various sorts of Fluids, shew it made up of heterogenous Parts. Leuenhoek & others agree that the largest Globles are red, & even in cold Animals only, as Fish, Frogs &c. It is said to be nearly of a size in all Animals, from the largest to the smallest, Dr. Jurin says 3,300 Globles make an Inch in length, Haller thinks them still smaller. The quantity is different under different

Circumstances

Circumstances & is more florid & thicker, thin & watry. The red Globules are heaviest & fall to the bottom, their Shape is not known, Lewenhoek says they are lenticular, oval or oblong, & that they alter their Shape in passing through their small Vessels; But this Hypothesis is not confirmed by late Authors. He says also that a red Globule swimming in a thinner Liquor is composed of six smaller ones of Serum, & Dr. Martin has confirmed this Doctrine, he says, that he could observe such Globuls would tumble into their constituent Species & then lose their red Colour & become Serum, this seems to agree with some Phanomina of Health, for puny & inactive Persons have their Blood less red than the other whose Blood is strongly compressed by the Action of the Solids, & will be most so when the Action of the Atmosphere is greatest, for the Blood will be the most rarified & pass through Parts that are weak & consequently cause Pain. Lewinhock also says, that the Globules of Serum consist of six other

Globules

# Of the Blood.

Glaubles swimming in a thinner fluid, which he called Lymph or Water, six Glaubles of Lymph united, make one of Serum, the Serum is lighter than the red Glaubles & heavier than the Lymph. He did not discover that a Glauble of Lymph was made in the same manner, but imagines it probable. D^r Hunter thinks it all fanciful as D^r Haller & others could see the red Glaubles only.

Blood taken from an Animal in health soon congeals & seperates into Serum and Coagulum, which swims in the Serum. The Serum is generally tinged with yellow perfectly fluid not Glutinous, not so thin as Water, but rather like Milk. If boiled, the greatest Part fixes like the White of an Egg, leaving only a little Water. when boiling, a Vapour arises, but if it is mixed with Water, it does not coagulate. It coagulates in Spirits of Wine & Alchahol. The heat of Water has the same Effect, therefore Boerhave inferred that an

an Animal could not live in above 100 degrees of Heat. A Pupil of Dr. Hallers, says that a Dog stood to the 104th. Degree; but what fixes the Blood out of the body will not have that Effect in the Body, it being there subject to the Vis Vitæ. The beauty of preparations is destroyed by the Spirits coagulating the Serum; such Fluids as resist putrefaction, as Salt & Water, Salt Nitre & Water &c. preserve it better but are more liable to decay. Sizey Blood has a buff-like appearance, & some thought it to be occasioned by the heat of the Fever, from being as it were boiled or coagulated, but this could not happen, as the Animal in that Case could not recover; it must therefore depend upon something else. This appearance is also fallacious, as when it comes faster or slower from the Vein, when fast, it continues warm longer, & upon the red Globules subsiding, the Buff turns up, but this appearance is made by the Serum. The Crassimentum has all the red Globules, & is the heaviest part, for when it once falls, it never rises again.

# Of the Blood.

It has also the Fiberous or Glutinous part, Why does it not sometimes swim? because not Watted upon the superior part, for the same reason, a dry Needle laid gently upon Water, will not sink. When the Glutin is steeped in Water, it comes out rather white, the red Globules being washed off. it is this Glutin that unites the red Globules & makes the Crassimentum. There is some similarity between Blood & Milk mix'd with Rennet, it is not heat but motion, that keeps the Blood fluid, when it stagnates in the Body it is resolved into Serum, the thinner parts are taken up & the Glutinous remain; in Arteries it forms a Polypus, at first tender, but afterwards it becomes firm, & when steeped in Water it becomes white, sometimes it runs into finer Branches & forms long filaments. In Anurisms the same thing happens, & it becomes firmer in proportion to the time & pressure. If the Blood remains in any Cavity, as in the Uterus, it becomes firmer, & if it is not thrown off soon, it comes in Clots, & often deceives Nurses, they taking it for a fleshy Substance & a Miscarriage.

What Ruychs maintains of the Blood, appears plain from this Reasoning; he says. "the Blood has a "disposition to form Membranes, which is no more than "the Glutinous parts connected, very different from old "Fibres in the Body, which are not found in the Blood. The Serum has different appearances in different Subjects, being sometimes as white as Milk. Lower that, to proceed from a sudden mixture of the Chyle with the Blood. Dr. Hunter saw one Instance in a Baker, where the Serum had the appearance of Milk or Cream, the Crassimentum was good, there was nothing in his health or Diet that could explain it. Blood Chymically examined, digested or distilled with animal heat, rises in some quantity, if in heat to the degree of boiling Water, seven ounces out of eight will come over, & according to Boerhave a mere Phlegm & Water & a dry Crust remains, if you add a still greater heat, an Oily, bitter or alkaline Spirit with a volatile Oily Salt coneribing round the mouth of the Vessel Then an yellow Oil, which becomes more yellow & fetid as Distillation is continued: the Blood contains a condensed Air also.

Dr. Martin

# Of the Blood.

Dr. Martin makes the proportion from Boyle & thus, 5 parts in 6 Water, 15 lb Oyl, 25 lb Salt 75 lb Earth, 28 lb Air consolidated in the Blood.

In a healthful state the Blood is neither Acid nor alkaline, but Alkalescent or Putrescent, if it is kept, when first drawn it is Neutral.

Any thing mixed with the Blood when out of the Body, has not the same Effect when taken in the Body, for when it suffers the power of digestion, it must certainly be very much changed. Of this the Antients were ignorant. Mixed with Salt of Hartshorn it grows dark coloured, does not turn into Jelly & is of a Creamy consistence. With distilled Vinegar it grows blacker & somewhat thicker than at first. With Spirits of Sea Salt mixed with Water it does not coagulate, but is of a dark Colour. With Foliated Tartar the Colour is florid & appears like Blood unmixed. If Blood after standing a little, is not sizy at the top but red, at the bottom is black probably from the property of the Air, not from Globules falling to the bottom, nor from compression, for when the

Bottom

Bottom is inverted it will become more red, from the action of the Air. This appears also from an experiment of Dr. Hunters for into a Phial that was corked, a little Globule of Air insinuated itself & made that part red, & the part in Contact with the Cork, as well as all the rest in the Phial, remain of a dark Colour.

The difference of the Arterial & Venal Blood is not the same as the supposed difference of the Antients, for they supposed the Arteries to carry Vital Spirits & the Veins to carry Blood.

Arterial Blood is brighter than Venal, tho' when Blood drawn from a Vein is briskly agitated in a Phial, it becomes like the Arterial.

# Of the Arteries.

An Artery in an Animal Body is a strong elastic ramifying Tube, that arises from the Heart, & goes to all parts of the Body. In this Sense there are but two Arteries, viz. Aorta, which goes all over the Body & the Pulmonary, which passes through the Lungs. Arteries in Greek signifies Air carriers, they were called so because the Antients thought they carried Air only. The Bronchia was also called for that reason, Arteria, & very properly too, it was also called Trachia or Aspera, from its roughness being composed of Gristles. Till Erasistratus, the Arteries & Veins had the same Appellation, they were both called Veins, the Arteries were distinguished by the epithet Pulsative. The Figure of the Arteries is round both in the small & large Vessels when filled with Blood, & from the beginning to the end they are Conical, becoming gradually smaller, but the dimensions of all the Branches together is greater than that of the Trunk, & therefore it constantly enlarges after every Ramification. The Shape & Size between Branches was thought by

by the Antients to grow smaller from the Heart, but from Observation it is found there is little difference; it appear'd to Dr. Hunter rather to increase in Size.

The Branches go off at acute angles very much like the Branches of a Tree, some go off at near right angles tho' we have not quite an instance of a reflected Branch, the most like it is the Epigastrick, coming from the Iliac, but if you examine closely, it goes off at an acute Angle & then turns up. The angles which the Branches make are frequently right ones, they form Anastimoses & Net Works. Branches of Arteries are different from those of Trees, as they unite again, but in the Kidneys they do Anastomose. The largest is on the Basis of the Skull of an Adult, which is formed by the two Vertebral Arteries, but small Anastomoses frequently appear, the Advantages arising from this is, that the Blood is more thoroughly mixed, & an Equilibrium kept up. For if one Branch is obstructed, the Blood goes to the collateral ones, or if it is too full, it passes off by another; another advantage is when the Artery is destroyed for a time, that part to which it went, may receive its Nourishment from the other Branches

## Of the Arteries.

Branches, as in an Aneurism, when the great Artery of the Arm is tied up, the part would mortify were it not for these Lateral communications. According to Leewenhoek, there are three kinds of Arteries, Sanguiferous, Serous & Lymphatic, the last are unnecessary; Boerhaves Error Loci (as in Opthalmia) may be hence understood, viz, when the Serous Vessels are distended with red Globules. The Arteries begin at the Heart & terminate in the extream Branches: the greatest number end in the Veins, some in Glands, that is, in secretory Vessels, & some upon Surfaces as in the spungy substance of the Penis, where the Arteries enter into the spungy Cells. The Arteries begin & run nearly in the Center of the Body, till a Branch is sent off to every part. In the Limbs they dont lie in the Middle but deep & as nigh the Bone as possible & generally in a hollow or Curvature of any part, that they may be as little stretched as possible. Hunter observes that Branches go off near the Heart at right Angles to

under

# Of the Arteries

hinder & at a distance in acute ones, that it might in a measure quicken the velocity of the Blood. Arteries in their Course run convoluted in some parts, as in the Uterus, because (as D^r. Friend observes) of the Distention, Gestation &c. But D^r. Hunter thinks that is not the Reason, for in this distention, the Arteries still remain Serpentine, & therefore answer some other End. In the Testicles the Artery runs convoluted. There are Valves in the Arteries, but these are at their beginnings only, viz. in the Aorta & Pulminary Arteries to prevent the Blood's returning back into the Heart. The Valves are made of three Folds or Skins, tho' D^r. Hunter has an instance of two only. The Coats of Arteries are by some said to be muscular, but they are plainly not so in Colour the Property of a Muscle is that it is red and unelastic, whereas the Coats of Arteries are white & very elastic, which may be proved by the Artery of an Ox, therefore they are not Muscular. D^r. Hunter takes it to be an elastic Substance of a particular

particular Texture, as white Leathers, viz. of a ligamentous Substance, which is elastic in both its Longitudinal & Transverse directions, & therefore the more so, the more it is stretched. The Coat of an Artery is of a considerable thickness. Anatomists divide it into an inner Coat which has a smooth internal Surface with a fine polish except where the Branches go off. This Coat is very thin & united to the next outer Coat, the Fibres are of a very fine Texture, their directions are not to be seen. The next Coat is composed of circular Fibres, & the last have Fibres of all directions. Arteries generally lie in the interstices of parts, surrounded with a cellular Membrane, which some, viz. the Antients have described as the nervous Coat of the Artery; but this is not properly a Coat, but only a connecting Medium between Artery and Muscle, every Fibre being surrounded in the same manner. A fifth Coat is added by some in particular Places, as in the Periosteum Periostium &c. but this is very improperly called a Coat. All these Coats, like other Parts, have

Blood Vessels called Vasa Vasorum. Blood enters in the composition of all parts, but in some parts in small quantities & by Vessels so minute as not to carry red Blood hence these Vessels appear white. Tho' the Nervous Filaments cannot be easily demonstrated, yet they are bestowed on them & supposed to answer some important Use. The whole Substance of an Artery is elastic & has different Strata or Layers for particular purposes. From their being in all directions, always bring the Artery to its former State after it has by any means been dilated or contracted, & they strengthen it both laterally & longitudinally, but it is more generally dilated than lengthened by the Blood. Its internal Coat answers two purposes, for it gives smoothness not to hinder Circulation & is dense in its texture that the finer parts of the Blood may not transide. after death the red Globules will transide but not before because the blood is thouroughly mixed with the Glutin, which gives it some degree of Tenacity. It is probable, that when the red Globules transide after Death, the pores are not altered, but that the Glutinous part is in a coagulated State, the Particles being

being attracted to each other, & the remaining parts being thinner, transide. Bile transides in a living Body, tho blood does not, as may be seen by opening a Body immediately after Death. The Arteries have a two fold Motion, viz. Sistole & Diastole, the first is contraction & the other dilatation, which is owing to a Gush of Blood from the Heart striking against the Artery, which being elastic, yields to this impulse of the blood, hence the Artery becomes more capacious & rather longer. These convolutions or lengthenings, may be seen in the Lungs of a Viper, & by injections, tho' they are not very remarkable, Haller confirms. In the Case of the operation for the Aneurism in the Arm, the enlarged Branches seem convoluted. 'tis the same in the Uterus, because of the influx of Blood. The Pulse we may imagine to swell more than it does, for it is less insignificant than is thought, it is scarce perceptible to the Eye. But the stroke is larger in proportion to the Artery, the swell is not in all parts of the Artery at the same time, tho' some attempt to explain it

it so by saying that the blood which is thrown out by the Heart, acts upon & propels at the same time all the blood before it; but considering the elasticity of the Coats, we may infer a priori, that the pulsations in all the Arteries is not at the very same instant, but that it is distant, & that it is perceptible; of this we may be convinced by feeling the carotid, & that on the inside of the Ancle, the pulsations of these are successive tho' quick; just allowing time to attend to the difference. The Pulse grows less gradually from the beginning to the end; & the smaller Arteries will swell less in proportion, as their size is less, because all the Branches together are larger than the trunk hence the impetus will be taken off. Another reason is, that the action from the beginning to the branch, will not be so strong, because the Heart acts by Jerks. When the Heart ceases to Act, the nearest part of the Artery will swell & contract again, but at a distance, it will be kept almost always distended & in its Branches it will run in a more equal Stream For this reason the Pulse diminishes & in fleshy parts, the Pulse is not perceptible because so many

Branches

# Of the Arteries.

Branches. The Heart originally carries on the circulation & the Arteries send forward the blood by contraction, hence we see the necessity of Muscular Fibres. That the Force of the Heart is not considerable is plain, for in a Child that soon drops of Navel String, the Cicatrix tho' very fine & thin does not bleed; but after death when the Arteries are injected full, it will break thro' at the Navel String, which shews that there is more force then used, than the natural force. In some Animals some parts have muscular Fibres. The Arteries are always full of blood, only the Column is sometimes larger & sometimes smaller, according as the Artery is in the Systole or Diastole, or as the Blood moves with more or less Velocity. This explains, why an Artery near the Heart bleeds with interruption, but in a constant Stream in the smaller branches; only sometimes faster & sometimes slower. Great Arteries bleed by Jerks, when the Heart acts & the blood moves with a greater rapidity near the Heart.

Heart. But Dr Hunter could not be so sensible of it as he at first imagined, he observed also, that in an Aneurism it moved slower in the large than in the small Part. Keil thought that the blood was 3000 times as long going through an Inch of a capillary as an Inch of the Aorta. By observing it with Glasses, the Blood seems to move faster than it really does, because Glasses magnify the Parts. Bellini imagined that Arteriotomy besides diminishing the quantity, would encrease the velocity of the Blood. And opening an Artery has this Effect, between the Heart & the Part where the incision is made, & in the neighbouring Parts, for it occasions a retrogade motion, & the blood ~~run~~ rushes out from all the adjoining Branches with great Violence. Haller was not sensible of an intestine motion of the Blood, but thought it went on in an equal Stream, but that in the smaller Vessels it flowed irregularly & had a retrogade Motion. Some imagined that a Globule might have a rotatory Motion on its own Axis, as a projectile Motion.

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# Of the Pulse.

Galen divided the Pulses into 100, & thinks a greater attention should be paid to them, as the knowledge of Diseases depend upon them. A deliciate knowledge of the Pulse may be acquired by Practice. A hard or soft Pulse depends upon the Arterial Coats principally, as they are more or less yielding; the hard Pulse proceeds from rigidity & tension, the soft from a more yielding & less tense structure. A large & small Pulse as well as the strong & weak depend upon the quantity of the Blood thrown in by the Heart, or more properly upon the force of the Heart, the quantity being more in a large Pulse, & less in a small one. They depend also upon the Coats of the Arteries being more or less yielding or the blood more confined in the Arterial or droit in the Venal System. The slow & quick depend on the state of the Heart. The regular & irregular are easily known; the intermittant is when a stroke is omitted, some are very sensibly affected by this intermission, by feeling a struggling or anxiety at the Heart, in some cases this is an alarming

Symptom, in others not. it is occasioned by too much Liquor Pericardii, or by adhesions of the Pericardium or by any thing that irritates. The Antients made very little use of the Pulse. Hyppocrates knew the Pulse & attended to it in ~~disorders~~ Diseases but not so much as Modern Physicians do, because he was ignorant of the Circulation

The knowledge of the Pulse is a great improvement & is not to be acquired without difficulty, for it is altered from many circumstances, as Size, Age &c. It is said to be quicker in the Evening than in the Morning, Exercise & hearty Meals increase it. Change of Weather & the Passions of the Mind alter it. Allowance ought also to be made for the habit of Body & for the Diseases of the Arteries.

# Of the Arteries.

Arteries are sometimes affected with Anurisms, which are of two kinds, when swell'd or stretched it is called true, but tore or wounded it is called false. Arteries do not easily supporate, which is a happy thing, for as they lie in interstices of Parts, they are often dissected by matter. Arteries are not liable to obstructions therefore Anurisms seldom happen from internal Causes. Ossifications are their most common disease, this happens to People pretty far advanc'd in years & generally begins on their inside first; their extremities are most subject to this Disease. D^r. Hunter thinks Ossifications owing to particular dispositions of the Body or Constitution (as some have a particular disposition to generate Stones in the Bladder) & not as the Antients thought to Age only. A Person at S^t. Georges had the Wrist Ossified & a crackling might be felt at each Pulse. In old People that have Mortifications, the Blood coagulates in the arteries & stops the Circulation of that part. Before the tying up of Vessels was invented, the Antients in Mortifications cut off the mortified part, being sure no Hamorage would ensue; but this Method is very troublesome, the Part being a long time coming off.

The Veins return the blood from the extremities to the Heart. They bear a great Analogy to the Arteries, being ramifying Tubes similar to them & of the same elastic Substance, only thinner, & we may say the same of them, that we have said of the Arteries, as to their Course, Branches, Anastomoses &c. in the Stomach & Intestines they give off Branches nearly together. Veins have nearly the same quantity of Blood to carry as the Arteries, but they are larger. hence the motion in them is slower, tho it grow quicker as it comes nearer the Heart. The Trunk being smaller than all its Branches. All Veins terminate in the Heart, but the Vena Portarum is lost in the Liver. their beginning Physiologically is in the Branches, but Anatomically at the Heart. The Veins are seven in Number, four Pulmonary, two Vena Cava, & the Vena Portarum. Their beginning was not known till Injections & Microscopes brought them to light. An Artery continued makes a Vein, or a Vein is an Artery reflected, with some irregularity, for if we inject a very thin Liquor, by the Arteries it returns by the Veins. Quicksilver does not prove a Continuation but a Communication, for it may break into a Cell and be taken up again; but Microscopes prove it.

There

# Of the Veins.

There are Veins which begin from the Internal Surface of Cavities as in the Penis, there are also absorbent Veins. Veins like Arteries are divided into Sanguiferous, Serous & Lymphatic, their general Distribution is the same, but different in the Extremities, as deep seated and Superficial ones without Arteries: in the Arm there are two deep seated ones that attend the Arteries, besides many cutanious ones, the same appears in the lower Limbs, the reason of which is probably that when strong muscular Motion in the Limbs, would prevent the free return of Blood, tho' the deep seated Veins, the Circulation might be Carried on without Impediment through the Cutanious Veins.

The Valves which make a little knot in the Veins are placed in pairs, & formed by two loose edges which prevent the Blood from returning back. Valves are not in all the Veins, for there are none in the Brain, Lungs, Thoracic or Abdominal Viscera: but they are found in the Extremities chiefly, and are placed irregularly, they are generally in the larger Veins. Were it not for the Valves we should be more subject to various swellings, for they take off from the length of the Column of Blood, and thus it renders its pressure less, tho' this is not

Their

# Of the Veins

Their principal use, because the long Vena Cava has none. Valves are not necessary to Circulation because there are none in the abdominal Viscera. Their use is this. That as the action of Muscles is strong in those places where Valves are met with, there would be danger of its retarding the Circulation and occasioning Mortifications, whereas by means of these every lateral pressure quickens it and hurries it towards the Heart. Some Veins near the Heart have something like a Pulse, which is occasioned by the action of the Heart, giving a momentary stop to the Fluids. In Veins of the Neck there is a manifest rising and falling. Also in those of the Brain, which is owing to respiration. The Veins which answers the Arteries are generally larger than the Arteries. Veins have no Pulsation for the same Reason that the ramifying small arteries have none, the course of the Blood being continual. For the Blood is propelled by two Actions. First that of the Heart drives it on, and secondly the elastic Coats of the Arteries react. The Jugular Veins appears to pulsate sometimes, when there are Polypi near the Heart, for these will impede the Blood. Veins in the Arm also appear to have a pulse from the Arteries under them. Not only Veins and Arteries but all the Vessels of the Body are elastic and will

bear

# Of the Veins

bear stretching, this our Constitutions seem to require. our Body is liable to so many Changes, as Fastings, Overloadings, Loss of Blood &c. By their elasticity we are able to bear a greater or smaller quantity of Blood at one time than an other, the Vessels always contracting or dilating so as to Accomodate themselves to the Quantity of Blood and thereby keep the system at all times full. When at any time the Veins or Arteries their elasticity, they are supposed to cause palpitations of the Heart, Faintings, & sudden Death; for when the Quantity of Blood is small & the Vessels have so far lost their elasticity so as not to be able to accomodate themselves to the quantity of Circulating Fluid, the pulse becomes irregular Intermitting, & the Patient is subject to palpitations of the Heart faintings &c. Mr. Page's Case is an instance. he had been troubled with a Palpitation of Heart for several Years & was always relived by a full Meal, which kept the Arteries full by supplying them with a fresh quantity nutritious particles, he made it a rule to take a Dram when ever he found himself attached with the Symptoms which gave him ease & as he immagined prevented his fainting by giving immediate Tention.

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It was easy to discover by his pulse when his Heart was affected and made its Struggle. Indeed he was sensible of it himself. He died suddenly and opening his Body, the Coats of the Arteries were observed to have lost their elastic Power, especially where the Aorta branches off to make the Iliac, and he seemd in General to have little Blood, which very well accounts for the Methods which gave relief & gives a hint that swathing moderately tight would have been of Service. Violent exercise is found to relieve such persons for a time Dr. Hunter knew a Man that put off the Paroxysms by violent agitation & swinging his Arms about.

Of the Effect of Blood letting & Hemorrhages Bellini says that Blood will run faster out of the Orifice than it does in its natural Course in the Veins because the weight of the Blood between the Orifice & the Heart is taken off, and the force which is necessary to drive the Column, will now drive the Blood thro' this Orifice with greater rapidity, for there is less resistance. Haller confirms this and says by his glasses, that Venesection accelerates the motion of the Blood. opening a Vein then in any part increases the Circulation in that

Part,

# Of the Veins.

Part, excepting at the time the Operation is performed for at that time it is slower.

Of Derivation & Revultion. Bleeding in the Diseased part increases the celerity of the Blood in that part. This is called derivation, because it draws the ~~Disease is called revultion~~ Blood to the part. But Bleeding in a part opposite to the Disease is called revultion, because it draws the Blood from the Diseased part. Thus Bleeding in particular Disorders, has an advantage. If we have a pain in the Head we bleed in the Feet hence the resistance in the feet being taken off, more blood is derived to the feet, and revultion is made from the Head. If a Pleuracy is in the right side to make a revultion we bleed in the left

Of Hæmorrhages. To stop Hæmorrhages the Antients made use of Ligatures on the Joints in order to abate the impetus of the Blood, for by preventing much blood returning from the Heart & Circulating, a Ligature answers all the Intention of V. S. But the Antients in stubborn Hæmorrhages of the Nose, Lungs, or Uterus, generaly took Blood from the Arm which is found to prevent other bleedings, by diminishing the Quantity and Making

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the patient low and faint. Dr Haller thinks the modern Practice preferable to the Antients, for opining a Vein may stop it two ways, by making a revulsion from the part, and by diminishing the Quantity of Blood, Entering the Vessels and lowering the force of the Circulation. The Symptom in general being too full. The making Ligatures on all the Joints has its use where the patient is very low as it does not exhaust him near as much as Venesection. tho probably it has the same effect as V. S. by causing a Langour, and the Blood thereby coagulating & Stoping the Mouths of the bleeding Vessels, this Ligature Should be taken off gradually, and the force of the Circulation be effectually abated, as if bleeding had been tried.—

Fainting is very beneficial in bleedings of all kinds, in floodings for Instance, this is the Method that Nature takes to relieve herself, for the very fainting that threatens the Life of the patient is the very Cure, and 'tis very advisable that these faintings should continue long, for if the patient of herself revives soon, or is recovered by Cordials, the flooding often returns. Dr Hunter supposes bleeding to stop from a Contraction of the Vessels themselves,

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and from a plug of clotted Blood, as in the Case in the Nose, by Bleeding where we lessen the Quantity of blood, and by the Bandages where we cause a Quantity of the blood to Stagnate. If not go round in Circulation we allow in both Cases the Vessels to Contract and the Clot of blood to be formed. D^r Haller recommends bleeding in all Cases of sudden Suffocation as from Damps &c. for by this puting the blood in Motion while the Animal is warm, he may have a chance to recover. The Doctor also is of opinion that the Arteries have something of Peristaltic or Vermicular Motion like the Intestines, Which serves to drive the blood in the Road of Circulation, independent of the Hearts Power. Tho we exert manifestly a greater force than the Hearts. This the D^r cannot prove, but thinks it Probable from the following Experiment; He opned a Dog a live, let the Blood out of the Mesenterie Artery & injected Milk into the Artery, and it returned in an instant almost by the corresponding Vein, but varying the Experiment, he opned the Vein and letting out the Blood, tied the Artery where it arises from a large branch and giving it time to empty itself, he injected

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by the Vein but was not able to make the milk pass into the Artery, nay some of the Veins burst, and by cuting into the guts he could find no tinge of the milk; hence he thinks the artery has a peculiar vermicular motion, driving on the blood in one Direction, but Denying it a Retrogade motion from the Veins into the Artery.

After Death very little blood is found in the Arteries and that little is thick & Coagulated; in the Veins on the Contrairy we find more and that fluid: the reason of this is that the elastic parts of the Artery contracting after Death squeze out the more fluid parts into the Veins, while the more glutinous part remains in the Arteries. For the same reason more Blood will be found in the Auricles than in the Ventricles of the Heart.

# Of the Lymphatics.

Besides the Arteries & Veins. there is a third System in the Body called absorbents or Lymphatics whence do these begin? they arise from the Internal surface of Stomach & Intestines. and also from all the surface of the Body: their use is to take up the fluids. and Mix them with our Blood. That they arise from the surface of the Body is evident from rubing Mercury, Gallic. Turpentine &c externally. They arise also from the Cavities of the Body. for if any fluid as Milk or Water be poured into a Cavity in a living body is soon absorbed. the same is obsered in Anasarcas Cases. The absorbents in the Intestines are called Lacteals from the Milkey Liquor they convey. The Lymphatics of Bartholine are probably the only true absorbents. One of the Lymphatics is a small slender Tube with very thin Coats. somewhat like a Vein, it carries a watery brownish & transparent sort of liquor. from a larger to a smaller Canel, & Anastomose as Veins do, & pass thro' Lymphatic Glands and terminate at last in the Receptaculum Chili. The Spleen of a Calf seems to be almost an intire Plexus of these Vessels. Their beginning are imperceptable to us; we raise them by powring Quicksilver, or blowing Strongly into the Arteries & Veins or by forcing the Mercury into

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the Excretory Ducts or even by blowing into the substance of a Lymphatic Gland: they become visible by putrefaction too but Experiments dont shew their beginning. It was supposed they begun from Arteries, or that they were Continuations of small Arteries, but one can never inject a Lymphatic by an Artery, without extravasation. Their Course is generally towards the Receptaculum Chyli from all parts of the body except those which terminate in the Thoracic Duct. The Lymphatics from the lower extremities creep upwards to the Loins, passing in their Course the Lymphatic Glands. The Lymphatic Glands are situated in the Cellular Membrane near blood Vessels, & have a lymphatic Vessel coming in & going out of them. They are in general hard roundish Bodies of the Conglobate kind, some are larger some smaller.

Mr. James Hunter found he could raise the Lymphatic at any time by blowing into a Lymphatic Gland; he went further and found that he could by puting a pipe into the Lymphatic fill the Lymphatic Vessels with Quicksilver from the Iliac quite up to the Thoracic Duct. A Professer of Berlin says the Lymphatic glands are not Cellular, but a Cluster of Branches of Lymphatic Vessels. The Use of Lymphatic Glands is not known. Dr. Hunter thinks the Lymphatics to be of the same use of the Lacteals which are acknowledged to be Absorbents, and between the Lymphatics and the Lacteals there is the greatest Analogy.

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# Of the Lymphatics

The Lacteals pass thro the Lympatic Glands in the Mysentery. in the same Manner as the Lymphatic Vessels. Some of the Lymphatics unite with the Lacteals, & go on to the Receptaculum Chyli. others run up with the great Vessels, & terminate in the Receptaculum Chyli; & some for Instance, in the upper part of the Body go into the Thoracic Duct. Lymphatics have Valves as well as the Lacteals and therefore are qualified to absorb. as thereby the Lymph will be formed one way only. he never injected the lymphatic by the Arteries except by extravasation. hence he concludes the Lympatics to arise from Cells or Cavities in the Gland: for when the Arterie burst, the injection got into the Lympatic Vessels by their absorbing mouths. which open into the substance of the Gland. That the Lymphatics absorb is very evident from rubing Quicksilver on the skin which gets from thence into the Blood and produces a salivation. and these absorbents are Lymphatics. appears from the Venereal Virus. If this infection is received in the Genitals, what parts are affected? the Lymphatic Glands in the Groin, which are the nearest & a Bubo ensues. If the infection be taken in at the mouth, the Tumor appears in the Glands of the Neck. & at the Breast or Hand, the Glands of the Axilla are affected. Thus the Lymphatic Glands are the seat of Buboes, & the Venereal Virus carried thither, by the absorbing

# Of the Lymphatics

Absorbing Lymphatic Vessels. Schrophulous Disorders are also situated in the lymphatic Glands, here they make their first appearance & affect the other parts of the body afterwards. D.r Wala in dissecting a Body, cut his Finger, & some of the poisenous fluid, being absorbed by the Wound. the Lymphatic Vessels was swelled, just along the surface of the Arm under the Skin, & the lymphatic Gland in the Axilla was much enlarged. Upon the whole D.r Hunter thinks that Fluids do transude all over the Body, that is a fine fluid, (not the red blood for that is too thick) even in the living Subject, & that the lymphatics (which are very numerous) absorb & return it again to the Blood in the Veins. The absorption of these Vessels are so great that Dropsies are cured by it and the lymphatics are furnished with Valves because they absorb for the Valves prevent the liquor returning. It is a question whether the Veins absorb or not.

# Of the Secretions

## And of the Glands by which they are performed

The General opinion is, that a Gland is a circumscribed apparatus of soft part abounding with Vessels: its Office is to strain off a particular part of the blood: as do the Liver Kidneys &c. to convey a liquor out of the body, or to serve for particular Uses within. The name of Gland was given first to the hermals which felt loose, moveable & hardish under the skin, like little Knotts. These were found to be of a particular Texture, viz. Soft, tender & brittle. The Liver being observed to be of this substance it was thence inferr'd, that these small Bernals or Bodies were of the same substance: and the larger being known to be Secretory Organs, it was agued that the smaller were strainers Strangers of particular Juices. Their Anatomical Structure was but little understood till of late. The Antients conceived, that the parts in the interstices were made up of coagulated blood, thrown out of the Vessels which they called Parinchema. In Malpighis's time the texture was first begun to be examined, he examined the Gland in the diseased Body, with Glasses & Injections of Ink, Wax in his time not being used for that purpose. From his Obervations he established. that it was composed of a Number of small bells, that receive a Juice from the Blood, retain it for some time & enriched it &c. & afterwards it is strained off. He observed also, that there was a simple gland, or a Follicle, as in the Throat, little Baggs containing a fluid. all glands he immagined were of the same kind. & this he

he thought might be proved by Analogy; these Glands being conglomerate which appeared Conglobate. Likewise by injections in the Kidnies he thought he saw the Ink which he injected attained in the Cells. In the Diseased Liver there is also a granulated appearance, being stained as it were with Bile, and thus they became visible. This Doctrine was generaly received & Ruysch was at first of this opinion, but in hundred cases that he mentioned, the Glands of Livers in a Diseased state was visible, after he made injections he found all was vascular without any Cavities; he observed that as Vessels grow smaller they grow more tender, and more so in one part than another, as is the Brain. He thought that the tender substance of the Liver was all vascular, first an Arterial then a Venal: he observed in most Parenchymatory Duct, which carries out the liquor that is strained off the Artery branches through the whole, making a second which brings the Blood, the Vein making a third which carry back the blood it has also a Cellular substance connecting the parts & Lymphatics & Nerves. It is probable that Ruysch is right, for when a Gland is minutely Injected, it seems to be composed of a Mass of Vessels without any extravasations as may be seen by Microscopes. Injections go far in unraveling the Structure of these parts. Ruysch says all are made up of Vessels; but Interstices do remain. Therefore it is possable there is something besides Vessels

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this Dr. Hunter thinks it probable that the whole is Vascular, for the Interstices appear less the more the Gland is injected. From very subtle fluids it may be proved there is a Communication between the Artery & Excretory Duct. these being continued from the Artery possibly in the same Manner as the Veins are: with this Difference, that they carry a particular part of the Blood. if so, the liquor of the Gland is not poured out into Cells, but is continued from the Vessel which is made from the Artery, & is called the Secretory Vessel. Ruysch also says, dont we see that a part of the Blood may be strained off without Glands? The Glands of the Body differ very much both Internaly & Externaly, as to their Excretory Ducts, and also in different Animals, Indeed in the same Animal at Different ages: they differ likewise as to the Vessels that receive the liquors, as appendages, viz. the Bladder to the Kidneys, the Vesiculæ Seminales, to the Testes & the Gall Bladder, some have no reservoirs, as the salivary Glands. In some there is a ramifying tube, as in the Breast: in others is is first smaller then larger ramification, which at last unite to form one tube. In the Kidneys from very small branches is formed a very Larg Excretory Duct. The Tubercle of the Testes are very minute, and at last grow considerably larger.

larger making the Vas Deferentia. The Structure of these Glands seems to be the best that could be, as in the throat the Folliculi of Malpighii are Reservoirs, which are always kept full of a Slimey Matter, with which nature has furnished these Gland, that in swallowing they may be compress'd, & yeald a thin mucus which covers the Bolus, & by that means renders Deglutition easy.

How the Secretions are performed. Concerning the Secretions one of the Oldest Opinions is, that in the Parinchymatous Substance there were Pores of Different Sizes & Configurations, where the blood being brought & Sifted, as it were. the Pores allowing only such particular parts to pass through them. The objections to this are first that all smaller particles might pass through, tho' this objection is indeed of no great weight, but the great Objections are first that it cant account for the Secretions, because Glands continue to perform their office without Disease for a Number of Years whereas from this Theory they would be often obstructed & become useless; but the greatest objection is that is neither the Pores nor the different Configuration of Glands, the shape being the same in all. An other Opinion was; that the liquors were changed in the Glands by a Levin originally placed there. This is a Hypothesis without any Argument to support it: for we can find no marks of any

particular

# Of the Secretions &c

particular leven that will change any Juice that will come in contact with it. Besides if Bile was made in the Liver by leven only the Jaundice would be incurable, the leven having defused itself through the whole body, it could not easely be contracted in its bounds again. An other opinion is that in secretory Vesels there was originally deposited some of that kind of fluid, which was to be secreted afterwards, as Gall in the secretory Vesels of the Liver. Winslow adopted and was so fond of this opinion in his younger days, that he says he saw the Cotton like substance in the secretory Vesels, straining off the fluid and says that some particles or fluids attract each other, and that other repel, thus the Gall in the secretory Vesels attract the Gall in the blood, but repels all other particles, because they are dissimular. secretions or surfaces may happen without glandular substances, this he illustrated, by Water & Oil mixed & strained through paper, which being porous, the watter transudes and attracts all the Watery Particles the oily remaining behind. But this opinion is not probable by attending to the formation of Animals, as in a child, which at first is very small, the body appears first, afterwards the blood, but the Bile does not then. Besides if this was the case

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the Jaundice could not be cured, because the Bile being thrown into the mass of blood, would still continue to attract particles similer to it self & so remain. The most prevailing opinion, & which has many circumstances to confirm it is that secretion depends principally upon the Different Diameters or sizes of Vessels. If the secretory Vessels were to receive only the smallest Particles of blood they would be of the first order, & perform the secretion, or if of the second order the Vessels will receive fluid of the second order, thus the smallest Vessels take up the smallest particles. Many other things may conspire to establish this principal.

Dr. Martins objection is that secretion cannot depend on the Capacity of the Vessels, because the secretion is the same in old as in young people, in large as in small Animals: for says he how can we suppose that the secretory Vessels are of the same size in a Man as in a Child, or in an Elephant as in a Mouse, & that they could strain the same sort of liquor at all times of life. But to answer this we are certain that there is not the same proportion of Growth & Extention in all parts of the body; for the Head & Liver in a Fœtus, is larger in proportion than in an Adult; and one Vessel in the body, Viz. that which contains the Christaline Humor, may be injected in a Fœtus of six months old, but not in a child born at eight Months; hence it is probable that the secretory Vessels may be so also.

many

# Of the Secretions &c.

Many things favour secretions as in the Liver, the blood drawn by the Vena Portarum from the bowels, Stomach &c. is supposed by the Physitions to come prepared for that secretion. Secretion will be affected by the nature of the aliment also, it may be assisted or altered by the Reservoir, as in the bladder the more watery parts are taken up, & the oily, earthy & excrementitious is thrown off. Something in life also assists secretion which cannot be immitated after Death. There different stages in the process of Secretion, as first a preparation, by going through the Abdominal Viscera, 2dly the actual Separation or depuration made in the Secretory Vessels. 3dly the absorption of the thinner part or the addition of something in the secreted fluid. 4thly the Excretion out of the body, as the Urine from the Bladder or the Expulsions from the Reservoirs to the part when it is wanted; or resumption of it into the body; some secretions being wanted occasionally only, as the Semen &c. and also the Milk in the Breasts, which if not drawn out will be absorbed; Milk in the third day becomes troublesome & in some runs out, in others reassumed into the Mass of blood. Concerning the secretions there are some Axioms, 1st that Secretions are carried on generally, constantly & Equally, when the Constitution is not disturbed, because so long as the Heart acts regularly to all parts by the Arteries, & the Strainers being continuations of these Arteries they will perform

## Of the Secretions &c.

these secretions. 2dly That some secretions are performed & increased only when wanted; as the Milk in the Breasts of living Women. 3dly That other secretions are occasionally increased as these for the use of Mastication ——— 4ly That in proportion that one Secretion is increased another is diminished: this serves to keep the Equilibrium in the Constitution 5thly That irritations from external things affect the secretions; thus external irritation on the Eye causes Tears. 6thly That Internal Irritations of the Mind affect the secretions; as upon looking at a sore Eye our Tears will often follow; in Hysterical people also the Secretions of Urine is increased. 7thly That Medicines promote some secretions electively according to some. of this kind is Mercury which increases secretion sometimes one way and sometimes another; as by Sweat, Urine, & the Salivary Glands; there are also those that affect particular Secretions. as Diuretics. and that act sometimes on other Glands. D.r Ld says it is a principal thing for a Physition to attend to the Secretions. or according to his Manner of expressing it. to turn the Ballance in favour of the Secretions ———

# Of the Nerves.

The Structure and use of the Nerves is but little understood, as we dont rightly know how they perform their Functions. The Nerves are whitish cords arising in pairs from the Brain & Spinal Marrow, & pass on in Ramifications all over the Body, much blood Vessels do. But to have a clear knowledge of them it is necessary to premise a few things concerning the Brain. The Brain is covered externally with the Dura Mater, in the inside of which and next the Brain, is another Membrane called the Pia Mater. The Dura Mater is a white Tendinous Strong Membrane of a Glittering Silver Colour. The Pia Mater is a very thin vascular Membrane with a great Number of Processes. The Tunica Archnoides, between the Dura & Pia Mater is seen in some parts without Vessels. The substance of the Brain is divided into Cerebrum and Cerebellum, & Medulla Oblongata which is continued to the Back-Bone, & forms the Medulla Spinalis. The Brain is a tender substance. the external part is called the Medullary. All that we know of the Texture of these parts, is that they are vascular, the interior medullary substance is collected from the Medulla Oblongata & Spinalis, which being lengthned out make the Nerves. — — —

The Origins of the Nerves is chiefly from the Medulla Oblongata & Spinalis, they are composed of a Number of small Vessels, each Nerve having a particular Covering from the Pia Mater, their exact beginning is not yet determined, for as they

go on they become blinded, and cannot be traced far. so that the Doctrine of the Decussation of Nerves may remain T. E. that the Nerves that arise in the right side go to the left: this opinion appears from physiological reflections, because when Injuries have happened the right side of the Brain the left side of the body was affected, & vice versa. where they emerge from the Brain they take the Coats of the Brain as first the Pia Mater which covers them before they get a particular sheath & this external Coat gives the Nerves their Strength & Firmness. their internal substance being probably the same with that of the Brain. all the larger Nerves appear to be made up of a Congeries of smaller ones except the Optic which appears to be made of the same Medullary substance at first, and when after it has taken on the Coat of the Dura Mater, its Medullary Substance only becoming more and more firm as it gets nearer the Eye-Ball. the Dura Mater also gives a covering to the Nerves at their beginning or soon after, but how this takes place we don't know, the smallest Nerves being probably invisible; for by the best Glasses, the smallest Nerves seem to be composed of still smaller. The Universal Communications of the Nerves destroy the Doctrine of Sympathy; as the intercostal Nerves which supplies so many parts. tho' their progress is nearly the same with the blood Vessels, yet there are a Number of Exceptions, at least it is as much as their Opinion will permit of, the one arising from

## Of the Nerves

from the Heart, the other from the Brain. thus in Arm the blood Vessels run up but the Nerves down, in the Leg & Thigh also, tho' at first at a distance. the one being before, the other behind, yet at the Ham they unite and so go on together. There is a great variety in the distributions of the blood Vessels in different bodies, but that of the Nerves is more regular, & nearly the same. Nerves give off Branches & ramify much as blood vessels, & where an Artery & Vein go off a Nerve generally attend them. Nerves being a bundle of smaller Filaments. their branching is no more than a large bundle sending a part of the filaments of which it is composed. Nerves also communicate and then two small bundles are united in one. their frequent anastomosing is called a Plexus, which is sometimes among the large, but more frequently among the smaller Nerves. These Plexus of large Nerves are not separated easily, because the small constituent Nerves become so blinded & Entangled. Arteries & Veins go to the Viscera nearly in the same manner as to other parts of the Body, but the Nerves are dispersed after the manner of a Plexus upon the Liver, Lungs, Kidneys, &c. & this makes it so Difficult to Dissect them,

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they being so very small. There we have not any tolerable Figure of them. Nerves have sometimes little knotts or swellings called Ganglions. There is no Instance of a large Nerve going to any Viscus but natural Ganglions. Their figure is different some long others round, & they are in great numbers in the intercostal Nerve, and are opposite to every Vertebra, the substance of that part of the Nerve where they are seems to be changed, for it is softer & more red. The first Cervical Ganglion of the intercostal Nerve is the largest in the Body. Ganglions are found where Nerves give off branches. Some (as Lancisi) say that a Ganglion is a swelling of the Muscular Fibres, which over rules the Nervous influence, and that therefore, Ganglions are not placed in the Nerves that go to the Organs of sense, but in those that go to the Muscles. Others thought a Ganglion to be little additamentum to the Brain producing here nervous filaments. A French Author thought that Ganglion were owing to pressure & inflamation from their appearance after amputation; but we must allow that Natural Ganglions are very different, because the lie in many places out of the reach of pressure and because in a Fœtus they seem to be regularly formed. The termination of Nerves is but little known, in comparison of that of Veins & Arteries, because these last may be injected but the Nerves cannot, allowing them to be instruments of Sensation, we may conclude that they terminate in every part of the Body, tho' ever so minute.

Of

# Of the Nerves.

Of the Blood Vesels of the Nerves. a Nerve is a pithy Substance. & the Optic Nerve is found to be Vascular. The Pia Mater has many Vesels the Dura few.

## Of the Use of the Nerves.

The Use of the Nerves is double 1st. to carry out the Influence of the Mind. & bring in Affections. 2dly. the Mind receives Information by them from Different parts of the Body. & so from external Objects. as in pain or sensation from external objects. They are rulers & manigers of Muscular Motion. carrying out the Influences of the Mind. They are in Use in that universal sensation which is deffused all over the Body. tho' indeed it is by Habit we learn what part is affected. They are not only the Instruments by which the Mind operates (as in the Actions of the Muscles) but those also by which it is operated upon as in distinct sensations. Hence there is Reason to believe that Constituent Nerves are seperate from the beginning to the end. We learn from Experience alone not only distinct Sensations, but command over the Muscles also, for Muscular Motion & Sensation are much confused in a Child, but the external sensations in him becomes very distinct. Internal sensations are more confused. & their place is not to be determined exactly, because it is not exposed to the Senses.

Of

# Of the Nerves.

## Of the Action of the Nerves.

From Experience the following Phenominon has been observed Viz. that if a Nerve going to any place be destroyed, that part looses its sensation: the same happens if the Nerve be only compressed for a time, as that in the Hip, & that in the inner Condyle of the Humerus which goes to the two lesser fingers. Some say the residence of the Mind is in the Brain. & call it Sensorium Commune: others suppose that it resides in the Nervous System all over the Body: but it is probable there is another sensorium, because when the lowe part is paralytic the seat of the mind is not destroyed. 2dly if a nerve that goes to any part be cut through, or whole cut off. the sensation remains for a long time, there is also sensation after the loss of a Limb. as though it was not amputated. it is therefore most probable that there is a common sensorium: 3dly if the Brain or Spinal Marrow be destroyed to a certain degree. the Nerves arising therefrom will become incapable of performing their office: 4thly as the Nerves destroyed occasions Palsies &c. so Irritations occasions Convulsions. An arm or any other part is said to be liable to two sort of Palsies, beside loss of Motion & Sensation at the same time: Viz. when Motion is lost & Sensation remains distinct & vice versa. If there are such Palsies as those, it should to prove that there a set of Nerves to bring in sensation, and a set to carry out the Influence of the Mind to perform Muscular Motion &c.

## Of the Nerves.

And some think this to be the case. By what tremulous motion, is sensation brought about? this is not known nor is it likely to be known. Some suppose that constituent Nerves are solid cords to produce Vibration. when it is to carry the Influence of the Mind to the Muscle it is Vibrated by the mind. when it carries sensation to the mind, it is Vibrated from without. It is objected of what use then is the Brain? but it may be answered, that it is necessary for the residence of the mind. & Mr. Jn.o Hunter observes the the Brain is not affected by Acids as other parts are, & that it has no Earth. The material objections to Vibratory System are the unfitness of the extremities of the Nerves, to receive such a Vibratory motion, it being thought that they terminate in a soft pappy substance, tho' this opinion is probable, yet there is no proof of it. Their Course is also unfit for this Vibratory purpose, for they are not streight & tight, besides these are soft, and lie in contact with other parts. The tightness or Relaxness of Nerves has no effect upon sensation. There are different degrees of sensation, by the same Nerve, which must therefore require different degrees of Vibration, and as many Nerves lie in one Cord, if they convey different sensations, they must alter each other, & so cause a confused sense. Another opinion, is that they are hollow & carry a fine fluid. From the similarity of Brain to the Kidneys, some suppose it to be Glandular. & that being a large

Secretory Mass, it must secrete a large Quantity of Fluid which must have one large or a great number of small outlets, and that the Nerves are these outlets, or the Excretory Ducts of the Brain. The following Experiment was tried and found to confirm this Theory. By pinching the Phrenic Nerve of a living Dog, Diaphram becomes paralitic, but if it be taken tight hold of a little higher up, and then stroked down, the Muscle was observed to act again. This Experiment has been given as a proof of the Nervous fluid. An objection to this Doctrine is, that the motion of the fluid in the extream branches would be very slow, too slow by far to answer the quickness of sensation. But to this it is replyed, that there is no current through the Nerves, but that they are always full of their proper fluid, and that when the mind wills, by giving an impulse at the beginning, there is an Undulation through the whole Nerve, and the impulse is communicated immediately to the other end, and that the same happens in returning sensations to the mind. The Experiment above mentioned did seem plausable at first, but after making repeated tryals, it appears that if the Nerve be compressed so as to take off intirely the Nervous Influance, stroking will have no effects and also that if the pressure on the Nerve be less considerable, stroking the Nerve upwards

## Of the Nerves.

upwards above the pressure, have the same effect as striping below. this makes intirely against the argument, and is a proof that it is the Irritation on the Nerve that produces the same Effect. ——————————

## Of the Cellular Membrane.

There are two species of the Cellular Membrane, the one adipose which contains the fat, and the other reticular which contains no fat; the Cellular Membrane is a composition of fibres variously interwoven like net work, and abounding with cells which communicate freely. It is supplied with Nervous filaments; by Injection it appears very Vascular, but few of the Vessels carry Red Blood, hence it appears whitish. Its structure is of the smallest constituent fibrous particles laid length ways, and aglutinated together which make a fibre, & these fibres aglutinated make Membrane, & the Membranes make Vessels &c. Hence it is supposed that there are some parts not Vascular, but from Observation D^r. Hunter thinks that all parts of our Body which are Visible are Vascular.

D. Haller

# Of the Cellular Membrane.

Dr. Haller seems to think that some of the Cellular Membra is an Organized Concretion with Vessels running upon it. Certainly there are Stamina in the Body that are inorganic Earth as the Basis of all our solids, and it is kept together by Animal Glue, which being drawn off the Earth falls to pieces: thus if a Bone is burnt, the particles loose their adhesion: and Papins Digestion deprives Bones of their Glue and makes them brittle; hence it appears that the Stamina of our body are made originally of Earth, united by Glue. —— Adhesions of the Lungs, grow loose after sometime, by the action of the Lungs, & Haller thinks the substance of the adhesio inorganic agelatinous concreted substance becoming Mem- -branous; but Hunter thinks that all parts whether natura or from Disease are Vascular: as adhesions, Calluses, Cicatrices, &c. for all appear Vascular by Injection: a Cicatrix appears to be the lengthning or shooting out of Vessels, Arteries & Veins anastomosing in a particular way not to be accounted for.

Of the Extent & Situation of the Cellular Membrane.

It is found all over the body, or with very few if any Exceptions & it is thicker where the Interstices are larger, & Vice versa. The Cellular Membrane Connects all the constituent parts of the body together. By some it has been called Membran. Musculorum Communis and has been Reckoned among the Integuments. This Membrane is dispersed Universally all over the body, except those parts that are loose as the bowels &c. and excepting an Instance or two, for the Vessels that run into the Bones appear to have Cellular Membra-

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and perhaps in the Compact part of the Bone also. & it is found in the Humour of the Eye. The Cellular Membrane may be inflated all over the body (as Butchers do their Meat) and this air gives it Whiteness & Thickness. An Anasarca, is when the loose texture of this Cellular Membrane is loaded with water whether from thinness of the Vessels or a fault in absorption or too great thinness of the blood, or too plentiful Secretions, is not known, but most probably it is from Exudation. The Legs are most affected, when the Patient has been long Standing. & hence small scarifications will empty the Vessels, by discharging the water through the Cutecular pores by Transudation. The Effusion of blood into the Cellular Membrane proves also that there is a communication from Cell to Cell, as on the outside of the Eye, the Vessels breaking the blood Effuses, the Skin being unhurt. in the diffused Aneurism, also the Artery being wounded, the blood gets into the Cellular Membrane, and goes from Cell to Cell all over the body. an Emphysema or Inflation in the living Animal may arise from internal or external causes, as Wounds, Lacerations or Ruptures of the parts serving to respiration, as an Emphysema from a Rupture of the Diaphragm in a Consumptive Habit, or from a Rib wounding the Lungs. Dr. Hunter mentions a remarkable case where the whole body except the hands & feet were Emphysematous from a fall off a Horse, but there was little of this Emphysema internally,

which

which circumstance was in the Patients favour his shape was distroyed quite, his skin was very tightly stretched and his eyes closed, and he panting for breath, upon making a small Incision the air rushed out in a blast: if this had not succeeded the D intended to have Opned even into the Cavity of the Thorax, where the wound first happned. Putrefaction also causes the Emphysema, for flesh when first thrown into water sinks but after some time it rises to the top. Dead bodies that have been drowned are boyed up to the surface of the Water. Putrefaction will cause an Emphysema in living bodies, because they proceed rather from stagnation than Putrefaction. The disorder that raged among the Black Cattle was ~~Emphysema~~ attended with Emphysema, which the Symptoms indicated both internal & External. There was a case in Georges Hospital where the mortified part was alway preceded by an Emphysema: the Man at last died. There was another case also where the Scrotum was pricked by a pin upon a blood Vessel, the blood from applying a Pultice diffused it self over the Scrotum & Penis, and threatned a mortification.

An Abcess is an Inflamation occasioned by Obstructions of the Vessels, for the Obstructions over load the parts which Turnify and grow harder. If the Inflamation is not dispersed it goes on to suppuration, which at length breaks through the distended Vessels & they throw out their Contents, and form a Cavity, in which the Matter is continually accumulating, being prevented from runing over to the Neighbouring parts,

by

## Of the Cellular Membrane.

by the surrounding Inflamed parts. These Suppurations for the most part point outwards, there being the least Resistance towards the Skin. except where it is covered with a Strong Fascia. An Abcess generally opens itself in the Middle, tho sometimes not. but the drain is generally depending. The body seems surprisingly calculated to cure its own disorders. Abcesses in the Lungs tho' near the Skin cannot point outwards, becaus of the Resistance of the Ribs, but the most part they point inwards. often kill the patient. Matter rather inlarges the parts by distending, pressing or breaking them down. Matter in the Abdomen works outwards. Sometimes acts upon the hollow Viscera. and gets into the Stomach & Intestines. whence the patient is seazed with Vomiting and Purging. which sometimes end in Death. Matter is said to be made up of Juices. & Vessels themselves. One kind there is certainly when there is no Visible distribution of Vessels. a thick matter from Inspissated Juices of an Inflamed Surface, having nothing like Ulceration or Solids broke down into it. Inflamed Surfaces have the property of ouzing out a thick fluid like matter; and of Uniting and consolodating parts, as the Lungs & Pleura. When old sores are cicatrized their skin is not so loose as other parts, but more contracted becaus the Cellular Membrane is Compacted by Inflamation. & also much exhausted of its fat. The nature of the fatty substance contained in the Cellular Membrane is different in Different parts.

In

## Of the Cellular Membrane.

In general it is divided into Masses more oily these are lenticular and are Vascular. The fat is strained off from the blood by Vessels properly constituted for that purpose, & then is lodged in the Cellular Membrane, and will encrease & decrease at certain times and upon particular occasions will be absorbed. D^r Hunter thinks in the Cellular substance there is a Glandular Apparatus for the Secretion, Absorption & Lodging of the oil in particular Cells or Bladders, which are small & interspersed through the Cellular Membrane, & thence the Absorbing Vessels go off. This Opinion was embraced, because of the Analogy between fat & marrow, which is made up of a number of transparent bodies, like the Roe of a fish, & the D^r supposes the adepose different from the Cellular Membrane, & that where there is adepose there is also apparatus for secreting it, and for its absorption as well as Lodgment; because in some parts the membrane is reticular as in the coats of the Eye. Penis & Scrotum; and also because the oil in a living Human body is fluid, besides we observe that other fluids change their place by their gravity, but the oil tho' ever pressed does not change its place or go from Cell to Cell: therefore it is most probable that the oil is confined in Bladders, & that it has no outlets, but adepose Duets. The Basis of the fat is the Cellular Membrane, the fat itself is different in different bodies; in very young Animals, as in a Child of Four or Five Months old, no oil is found it being rather a Gelatenous Substance.

In

## Of the Cellular Membrane.

In Children the Oil is next the skin but as they grow older it gets more internally, and into the Interstices of parts. The Viscera of Children are free from fat. The Anasarcous Dropsy distroys the fat more than any of the Diseases, what was adeps become very much Changed.

The Principle use of the Cellular Membrane is to connect the constituent parts of the body, & to admit of any easy motion of one part on an other, as the Muscles &c. It is very easy where the parts require considerable Motion but it is wanting where the parts have a free pendulous Motion, as the Bowels. It is said to give the body a figure by filling up the Interstices of parts according to Hogarth. it is a defence to the body of Children, Soles of the feet, Nates & Scrotum of Adults. The Animal Oil seems to keep the body warm, for People as well as Animals are fat in Cold, & lean in Warm Climates, & in cold Countries Animals grow fat against the Winter. It is of use also to keep up an equal Degree of Nutrition, for the Oil is taken up when a supply is wanted through a difficiency of food, as in fasting, some imagine that the Oil mixes with Lymph and makes a Mucilage to lubricate the parts, but this is much to be doubted. it is said also to sheath the parts against the Irritating Fluids.

# Of the Muscles.



A Muscle is a portion of red flesh that has the power of shortning or contracting itself, and is the instrument of motion. A Muscle is generally oblong & goes from one Bone to another, tho' not always. At each extremity of the Muscle there is generally a white substance called a Tendon. The Structure of the Musculous part is manifestly made up of bundles of fibres runing in the direction of the muscle, and connected by Cellular Membrane, in a quantity proportioned to the Interstices of the fibres. These constituent fibres are not visible consequently their appearance is not known with any degree of certainty, tho' it seems to be irregular, when a Muscle is taken to pieces. A Muscle has besides Cellular Membrane, of which there is more on the outside than between the fibres) fat more in some than in others (it being accidental) in order to allow an easy or free motion. It has also Veins, Arteries & Nerves. The Arteries have no uniform manner of entering as those of some of the Viscera, as the Coronary, Hepatic, the Emulgents of the Kidneys, &c. A greater quantity of blood is brought to a Muscle than is necessary for its nourishment, which probably may assist its action, there is nothing remarkable in the ramifications of the Arteries here, tho' they anastomose frequently; when a Muscle is minutely Injected it appears to be almost wholy Vascular, but the greatest Number of the largest Vessels run in the Interstices of the fibres tho' some run a cross them: from Injections it appears that there is nothing remarkable in their arangement, only that the branches grow smaller & anastamose often.

Dr

# Of the Muscles.

D^r Albinus says that the Arteries are attended by Veins and Nerves which go to the muscular flesh in great plenty, and there are more Nerves in Muscles according to their size than in any other part, and those that have most action have most Nerves, as the Muscle of the Eye &c. but the Heart seems to be an exception to this rule, for tho' it has most action, yet it has least Nerves. When a Nerve enters a Muscle it loses the Coat it received from the Dura Mater by D^r Hunter thinks there is no reason to believe this.

## Of the Tendons of the Muscles.

A Tendon is a White glittering substance of a fibrous appearance, very compact, smaller than the Muscle it self, and much more firm & tough. The Tendons are fibrous, & the threads composing them are united by Cellular Membrane, tho' but very little, & that running in the direction of the fibres. Tendons are not red because but few of their Vessels will admit of red blood they are nevertheless Vascular all through, and from a Minute Injection, Vermillion may be thrown into those Vessels that do not naturally carry red blood. Some Muscles have Tendons at both ends, others have not, but are fixed without the Intervention of Tendons. The fleshy & Tendenous fibres are generally reckoned by Anatomists to be one continued fibre, common to the tendinous & fleshy part through the whole Muscle, & that the Tendon is the fleshy part compacted into a Cord, they say also that

that the Tendons gain on the fleshy parts in proportion as people grow older, and Haller says that a man has longer Tendons than a Boy in proportion &c. But there are many instances in the Human body, where the Tendinous fibres do not seem to run in the same direction with the fleshy fibres. And D. Hunter thinks contrary to this opinion, that the portion between the fleshy & tendinous parts is regular in growth in different ages. He thinks also that a Tendon is a distinct substance or Cord, on which the muscle acts, and that it is not the same continuation through the Whole fibres. The Use of the fleshy parts is to shorten its length occasionally & so become the Instrument of motion, let the direction be what it will. The Arteries & Veins of the Muscles contain more blood than is necessary for its Nourishment. This over quantity of blood is supposed to serve some other purpose, viz. to serve as a concurring cause to the action of the Muscle: but it is not the causa sine qua non as Albinus says. Nerves answer the same purpose in Muscles as they do in other parts, they convey an Influence from the Brain. The substance of a Tendon is inelastic, & contracts, it is a Cord going from the Muscle to the part where it is to exert its action: and a Muscle may have its Tendon or not. A Tendon has but a small Quantity of Nerves contrary to the Antients. Tendons are servasable to hinder Joints from having but a certain degree of Motion. & they make a smaller Mass. for if Muscles had been in the hand or fingers they would have been very bulkey, whereas now being

on

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on the fore arm, and sending down Tendons, the Hand is very small, and has a great Variety of Motions; for Tendons make motion more free. It is an advantage that Tendons come from Muscles at so great a Distance from the part that is acted upon, as it will be less fatiguing for the weight of a Muscle in a perpendicular Column, when the Arm is acting in a Horizontal direction, likewise when Muscles play round the Head of a bone, the hard substance of a Tendon is more capable of bearing friction. In a healthful state the Muscles are of a deep red Colour, which is not inherent but owing to the blood in its Vessels.

## Of their Attachment.

The Large Muscles have large tendons, which seem to pierce the substance of the bone, the lesser tendons seeming to adhere to the Periosteum, Cartilages, Membranes & even fleshy parts. The Muscles fixed in soft parts not only move, but alter their shape also, as the Tongue. Muscles are divided into three kinds, the Oblong, the Hollow, & the Mixt. Oblong as those of the Arm, to bring the parts to each other. Hollow as those of the Stomach, Heart, Bladder & Intestines, their fibres going round & round to diminish them; they surround their contents & are in general expulsive. Mixt as those of the Abdomen. The Oblong are divided first into rectilineal, tho' there is scarce a true one in the whole body 2dly Half Pennaform, like the feather of a Quill split through. 3. the

Muscle

Muscle of the Flexor Pollicis Longus. 3dly a compleat Pennaform as the Gastrocnemius. two or more of these make a Complex Pennaform as the Deltoid. In the oblong we see the Radialis & the Pectoral &c. The Rectilineal & Pennaform run nearly between point & point & have the same use, but in the Radiated, the action of the fibres is different; where reflection & extention is only required (as they are the most simple actions) the oblong will do, but where the action is complex it requires fibres in all directions. The advantage of the oblique direction of the fibres, is that we can have a greater number of fibers in a given length of Mass: and absolute strength, is as the force of any single fibre that is exerted; hence will appear the disadvantage of the rectilineal: the disadvantage of the Pennaform is that they are short. Where Nature wanted to pull a great length she used the long or Rectilineal, but where a little way only and with strength the Pennaform. In general the fibres of Muscles are of the same length, that they may act together & have the same degree of Contraction: tho in the Radiated Muscles this does not hold true, and for good reason some of them being to act single.

The Names given to particular part of Muscles, are the one End called Head or Origin. the fleshy part called the belly. & the other End called the Tail or Insertion. Winslow is for rejecting this language, and for naming them from their attachment or the place to which they are fixed. & not Head or Beginning, because the Head was said to be that part

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least moved, & the Tail that which was most moved, but as both ends acts upon some occasions, he thinks these Names should be rejected to avoid mistakes.

## Of the Appendage of Muscles besides Tendons.

There are Fascia broad tendenous aponeurotic expancions to keep parts in their Situation: also Frena or Annular Ligaments to keeps Tendons in their proper plaies, & some more properly belong to Tendons. Likewise Pullies, as a Cartalage for one of the Muscles of the Eye, viz Trochlearis Obliqus Internus, the Bones are Pullies sometimes, also Sacular Mucors'd, so called by Douglass the Discoverer, where there is friction between parts to make motion free & easy. Albinus calls them Bursæ Tendinibus subjectæ. It is plain why Tendons are used instead of proceses of Bones, because first a Tendon is much stronger in the same bulk, 2dly if a bony process was to run across a Joint it would make it rigid, whereas a Tendon allows of flexibility.

Some Muscles have always been called as they are at present as the Diaphram, some have given to the Muscles Numerical Names but now they have particular Names given from their Use, & they are classed according to their Offices, whether Respiration, Flexion, Extention or Rotation.

# Of the Muscles.

The Action of the Muscles is different according to the direction of their fibres; one part of a Muscle may act independent of an other, as in the Deltoid; the Unity of action & Unity of Bulk make the Unity of Muscles. The action also varies, as the part on which it acts be hard or soft. The Combination of Muscles also causes a great variety; and the radiated Muscles are found where the action is very various as round the Shoulder. our motions are more compounded than we are apt to imagine many Muscles being concerned in the most simple actions. In Muscles we must consider their absolute & relative force. the absolute force of Muscles will be equal to the number of their fibres, & the force which it is able to overcome. this will be different in different Constitutions according to the nature of the fibres. in animals also it will be in proportion to their size, the fibers being stronger & harder. the relative force is that with which the Muscles of the Body are capable of acting upon the Machine. some say that the relative force is greater than the Absolute but the contrary of this is evident, from two reasons. 1st. the Muscles are inserted nearer the center of Motion, than the resistance, and run paralel to the bone. 2dly they are inserted disadvantagiously as to Direction. Doct. Haller supposes that the relative may not be more than a Double part of the Absolute. the reason is from this disposition. the Muscles are neater more compact & our actions

more

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more quick. If absolute is different in different bodies, the relative will be so of Course, but absolute & relative force cannot be determined, as one can scarce be done by one Mass of Muscle. Muscular Motion is not Elasticity or nearly the power of contracting; the contraction is according to the length of the fibres. If a Muscle is stretched beyond its full length it soon breaks, not having more Elasticity than what is common to other soft parts of the body, besides elastic bodies must be acted on before they react, which is not the case with the muscles, and also all elastic bodies act with more force in proportion as they are acted upon, but it is the contrary with muscles. Muscles naturally shorten themselves, as much as they can, viz. they run into a streight line, & become contracted, but this force may be easely overcome when the Muscles are warm, but if they once become cold, they require some force to draw them out to their stretch, and when moved after they have been cold, they always remain loose & flexable. Figures of Muscles ought to be taken in their contracted state, and cold will contract them, but it is not owing to want of contraction that Albinus' figures tho' so finely executed want this swell. if Theory be contradictory to these facts, it cannot be true, tho' an Hypothesis may, tho' it does not account for all actions. A Muscle in action grows tight and endeavours to throw itself into a right line, and becomes hard in its substance, and swells the more it acts.

2dly

2.dly The Muscles in acting become shorter if the resistance do not ober power it. 3.dly It shortens itself one third of its length, (& this Phenomenon distroys most of our theorys) as a muscle of Nine Inches would shorten to six. In the Hollow muscles as in the Intestines the contraction is very great in the Penis, & the mouth and the Urinary bladder which holds a pint may be contracted to the size of a Nutmeg, as in the case of sudden death. The whole Mass of Muscle in action was supposed to be diminished, as the Heart, (but this was not owing to compactness of fibres) D.r Hunter thinks it nearly the same. Glessons Experiment of puting his arm into Water, & puting it to action, ~~was unsatisfactory~~ is not conclusive, for tho' the water fell when the Muscles contracted, yet it could not be done with sufficient accuracy, becaus the Arm might be moved higher or lower. & likewise his Arm hanging down the blood vessels would be loaded, but by contraction the blood would be drawn out of the Venal System. Muscles have been said to grow pale in contraction, but D.r Hunter thinks it is not true: & it was said this paleness arose from the bloods being thrown out as in the Hollow Muscles. Muscles are naturally lax, in shong degree of contraction, and act with no appearence of force; tho' it was thought by Physiologists that the Muscles were acting constantly & strongly & that a considerable force was required to overcome it. as the Sphincter Ani! & the Muscles that are at rest have antagonists, and an additional force of either was sufficient to give a Turn. In a body just dead, if the Muscles are cut through on the one side

those

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those on the other remain the same. In a living body also if the Muscles are cut through, the Antagonist do not act, so as to throw that side into action, or draw it to that side immediately; as in the case of a Num whose Flexor Tendons of the fingers, being cut through, the Extensors did not turn thereby to be put in action. In a Hemiplegia also, the mouth was observed to be drawn on one side, which was done immediately when the other side was seized Paralytic, but the person a little after turning his mouth to that side, those sound Muscles of consequence contracted, and the Paralytic ones in the other side were not able to contract themselves to draw the Mouth into its right position, & this is the case of all disorders of that kind, and in Ruptures of the Tendo Achyllis, and in ~~Transverse~~ Fractures of the Patella, the Tendons were found contracted, which are to be accounted from the same principals, viz, the action of the Muscles on the opposite side having none to react on the other side the Tendons being broke. The Nerve of the Brain from which it arises being irritated the Muscles are thrown into very irregular actions, as Griping or pricking the phrenick Nerve irritates the Diaphragm, & if the Brain or Nerve be destroyed the part looses its action. —

Of the Blood Vessels of Muscles. if the artery that goes to the Muscle be cut or tied, the muscle becomes Paralytic, some say that this happens from the blood being prevented from geting to the Nerves and not from a want of blood

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in the Vessels. The action of the Muscles are instantanious, and in most parts obedient to the will. Irritation from warm thro cause Muscular contraction if thrown into an Artery or upon a muscle, in some Animals Muscles have a power of contraction whe the communication is cut off both by Veins & Arteries, and irritated or broken. The Action of Muscles are of three kinds. Voluntary, Involuntary (Heart & Intestines) & Mixed, as those o respiration which do not require the constant attention of the Wil tho' they are in some measure influenced by it. Some Muscles in some Animals continued to act regularly for some time after the communication is cut off between the Hear & the Brai as in a Viper. In a paralytic arm the Pulse is regular, therefor the fault lies in the Nerves. Before the time of Des Cartes Phy siologists did not attempt to explain muscular motion in a Mechanical way, but were contented with general Observation for after Galen the Antients thought the Muscles had a power contaction which was caused by a particular Influence they could not account for. Borelli unsatisfied with this account, thought that the Cells were filled with a blast as Organs are, and that the Mind opned the different parts and regulated them as Necessity required. D. Crow supposed Muscle made up of Tendinous fibres with a porous substance & that when thrown into Action there is a derivation of a greater quantity of animal Spirits from the Nerves, and of blood fro the Arteries which meeting causes an Ebolition, but a Muscle in Action does not increase so much in Size. D. Matthews supposes a Muscular fibre to be a Chain of bladders betwixt

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the ends of Arteries and the beginnings of Veins, and which strain a Juice from the Nerves, which he says will raise a contortion between the Nervous Fibrillo, and cause a contraction; That of the Nerve is Nervous Juice, & the other a Retroacrial Juice. Borelli endeavours to explain Muscular Motion, by saying that a fibre is porous & Rhomboidal, and that the Nervous Juice meeting the Arterial blood, the Muscle was put into action, & reduced the Rhomboid into a Square. Bernovelli supposed it an improvement to suppose that the Rhomboid would become rather Spheroidal from the equal pressure on all sides. Dr. Keil says supposing this true, a Globule of blood finding a Glauble of Air in every Cell, it reacted to the Animal Spirits, and the Air expanded and caused contraction. Boerhaave supposed a Muscular fibre to be produced from an Artery, and perhaps also when the Muscle wants to act, the Nervous Influence rushes into the fibre, and produces the action by distending the bladder in the fibre which must inlarge the Muscle. Some suppose the Cells of a fibre are filled up with Juice, which comes from the Artery, and Dr. Nichols supposed a Muscular fibre, to be a chain of Cells, filled by the Arteries, and that the Nerves prevented the blood from geting into Arteries. The Nerve being twisted round the Artery, hence our command over the Muscles. To prove this, he says, that the Muscles off the Head of a Bird, when the Nervous Influence being taken off the strongest Muscles shall be thrown into action, thus the Wing of a Bird shall beat, & the Legs of a

Dog shall turn backwards. It cannot be that Muscular Motion is performed by what comes from the Vessels, because the Arteries are too small, and the Motion is as quick as thought. & also the Nerve being destroyed the Muscle of any part becomes relaxed. The Periphery of a Circle is three times its Diameter, and if one round Cell is a foot, when lengthined it will be no more than a foot and an half, whereas Muscles we know have the power of contracting themselves more than one third.

Irritability in Muscles is only a power of contraction from Irritation it is not supposed more than any other part is irritable, in this Sense Nerves are sensable and so may be Irritated but cannot contract. Harvey & Haller thought that the action of the Heart depended on this principle. & tho' this is not new doctrine, yet perhaps Haller has served to make it better known, and establish it.

# Of the Bones and their appendages.

Animals & Vegitable Substances appear to be compounded of Organizations, whereas the Mineral appear to be rather a concretion: both the hard and soft parts of Vegitables seem to be Vascular and in Animal Bones the hardest parts seem so too. In the Human Bone there is first the hard Ivory like substance, next the Cellular or Spungey and the third may be called the reticular, which is no more than the spongy become very rare, so that two Divisions will be sufficient. Bones at their full Maturity may have Vessels, but they are not easely traced, because the fibres are so close. The long matter seems to shoot in fibres, which may be seen in younger bones especially those of the Skull which are thin; the fibres shoot from the Centre to the Circumference, & besides these radiated fibres, they are intercepted with transverse fibrills. The Lamina of young Bones are easely seperated. A Stratum of fibres compacted is said to form a plate; & plates compacted form the thicker substance. Bones do shoot in fibres as we may see in the most compact; and the cellular part is of the same kind, only the fibres are of different directions. Gagliard thought that there were little processes like Nails that kept the plates together. The cells in the Cylindrical Bones have been very accurately examined by some, but these cells are very irregular as to their shape and disposition; therefore such an examination is rather idle. The reticular substance which is in the hollow of Bones (called the cavity of

of the Marrow) is so fine that some say it is distroyed by the common method of cleaning Bones, but from the ends towards the Middle of the cellular Membrane becomes more rare & thin, so that the compact part gradually degenerates into stiff fewer cells, called the reticular: there seems to be a small space in the middle of the Bone without these reticular fibres; there is Bone in the Body that is compact through & through, & the use of these Cavities is first to be a reservoir for Marrow, but perhaps it answers the purposes of Adeps. The Cavity in the Bone which contains the Marrow, is smaller in the End, and larger in the middle, and the end has been said to contain the thinner, & the middle the thicker, but this does not hold true in the Human Subject. This hollow makes the Bone stronger with the same quantity of bony matter, and the Bone is more secure from breaking, the long fibres being at a greater Distance from the Centre of Revolution, it is remarkable that Birds have larger Cavities in their than Men, by which they have a sufficient strength and is very slight also. Bones require a great length of time to be perfected, therefore if there was more bony matter it would take more time. Trees that have stood a great number of years are solid but their growth is slow, whereas the annual plants are Hollow, because they must be produced in a season, and be strong enough to resist the Injuries of the weather, such as Corn & all vegetable substances are Vascular, if we except the Animal in which

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which it cannot be proved. The Vessels of Bones did not appear so distinctly till the method of Making Bones diaphinous was found out, from which they appear Vascular, and the more so perhaps from the aiming Membranes of the Marrow. Vessels come first to the outside of the Bones, and from all the Neighbouring Vessels every where from the one End to the other, be the Shape what it will. Besides these Vessels, there is especially in the Cylindrical Bones a large Artery and with Veins & Nerves attending, it branching through the whole, & entering into the Middle, and geting upon the marrow, branches from one end to the other & these branches also get from inside outwards. In a large Exfoliation, if the inside of the Bone did not receive Vessels from within, it must soon mortify. The compact substance of the Bone is said to have feeling; but it is probable it has Nerves as Filaments may be seen going to some Bones. The Bony matter is most likely deposited in Veins, and so wasted through gradually, especially in particular constitutions, and old age. Some say that there are Medullary Canals to carry Marrow from within into the compact substance of the Bone to prevent its growing Brittle. They say that the Canal goes outward a little way transverse & then longitudinally, and from these some are going again transverse. It was supposed also that from within the Pores were larger ~~as they proceeded outwards~~ &

and lesser in going outwards and that the Canals were large on the outside, and gradually less inwards, serving as a bed for the blood Vessels. and also the Canal for blood Vessels were round, but the medullary Canals oval in a transverse Section, but D. Hunter from Examination could not discover this appearance, and as the blood Vessels came from within outwards it distroys the distinction; and he thinks that this oval appearance is where a blood Vessel branches off to an Astomose. The reason for the Theory of Canals, was that the oil soaked through, but as bones are porous, this may happen without these Canals. Marrow fills the Cavities of Bones and is analogous to the fat of the body, both being either hard or soft. Therefore there are two kinds of Marrow, the Medulla and succus Medullaris. or true marrow & Juice of Marrow. Marrow seems to be a glittering substance only Vascular. its Structure is simular to the Adepose Membrane only less firm. The internal periosteum is said to be the lining of the bone, by some & by others the Covering of the Marrow, but this internal covering D. Hunter says he never saw and he believes there is none, tho' he say he dont know but the Marrow may be contained in little bags, as we see in Quadrupedes, where the appearance, is that of a little fine Membrane, supporting Vessels, a more tender Adepose Membrane. D. Hunter thinks that Marrow is insensable, and that there are absorbent Vessels which gradually

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throw it into the Circulation, and that it keeps place with the Adeps of the body (there being more marrow in proportion than Adeps) tho' the hollow of the bone is never empty even in the most lean, but the substance is thinner.

## Of the Use of the Marrow.

It is immagined that marrow does no more than fat in other parts of the body, tho some say it prevents bones from being brittle, but D^r. Hunter doubts this, and thinks that bones are brittle, rather through want of earthy matter & Gluten, and not from scarcity of marrow. The earthy matter may be taken into the Constitution and so may the Gluten also. It is also said that the marrow transudes into the Joints, & mixes with the Sinovia of the Joints D^r. Hunter is inclined to believe this as he never could find any upon the Cartilages of the Joints when drying, tho' he found it transude on every other part of the Bone.

## Diseases of the Marrow.

The Marrow being Vascular has diseases, but not often from Obstructions to which it is not very liable) which breaks down its substance being covered with bone. The Marrow is supported by the Reticular substance, so as not to be misplaced by a Shock. When the diseases begin in the marrow it produces a true Spina Ventosa. The Periosteum with which the bones are all covered, is mostly made

made up of Glistening fibres. Its outer layer is made up by the Ligaments & Tendons spread over the outside of the bones on its surface & fastned to it by blood Vessels; hence the outside is made up of a very different disposition of fibres, the direction being the same with that of the Tendons & Ligaments which come to the bone, this appears plain in the sternum. The inner lamella seems to be made up of the same Tendanous or Ligamentous substance without any difference; for with more trouble it may be divided into three layers. The Periosteum has been imagined to make a general covering for the Skelton, but this is not altogether true, for all the joints, strong Ligaments & Tendons, seem to enter the bony substance, and the Periosteum is observed to have more blood Vessels than in other places, which is from the Vessels that go through it to the bone. The Periosteum must have nerves, yet it is far from being so sensible as has been imagined. D^r. Haller thinks that it is not at all sensible, but the D^r might be mistaken trying on the Tibia only, where a large nerve runs upon the fore part, which probably supplies the bone with nerves, & easely cut upon taking off the skin. The exposed part of the Teeth are without Periosteum, there being here a Pericheondrium, and where large Ligaments enter, there does not appear to be any Periosteum.

The Use of the Periosteum, is that as the Bone is rough and hard, this covering preserves the soft parts, it

preserves

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preserves the blood Vessels also, which are first fixed to the Periosteum; it covers the Epiphyses as well as the whole bone, and makes a firmer union. Dr Hales Experiment made on the Femur of a Calf, proves this for 119 lb Weight pulled off Epiphysis, when deprived of Periosteum, but 500 was required when the Periosteum was on, besides this, the Ligaments & Tendons adhere more firmly to the bones. It has been thought to limit the growth of bones; but what limits the Periosteum in this case? for the bone is at first firmly covered with it: and this does not happen, because the concave side of bone is regular, as well as the convex, it's supposed also to help on the Circulation in the Arteries by its Elasticity, but this it does not do, and if it did it would prevent the return of the venal blood; also the force which the Artery must use to cause the motion, would be as much as it would gain from the Periosteum, allowing it to be Elastic which is not.

Diseases of the Periosteum. It suppurates unkindly and forms Matter, & sloughs off: this holds true of any tendinous expansion or aponeurosis. This is of bad consequence being so near the bone. When Matter is within the Periosteum it should be let out as soon as possible, for the Periosteum being unyeilding, the matter runs or under it and causes a great part of the bone to be injured. It seems to be a part which the Venereal poison affects very readily, it falls upon the Throat Shin & Periosteum, when it falls on the Bones. Tho' it causes hard nodes, yet the Periosteum only is principally affected.

These

Thes Gummy Substances are not to be reached by Mercurial Courses sometimes notwithstanding the rest of the Constitution may be clear of the poison therefore they should be laid open either by the Knife or Caustic, and if these be laid open before the patient enters upon Salavation, it will by that means be more readely cured. If this Pus is neglected it remains troublesome, and perhaps the Cure will be lengthned out, and after all probably it must be opned, and the bone may then be carous. It seems to be a poison that chiefly affects the external parts, as the Skin, Head, Face &c. as being most exposed to Air, and also the Throat and all other parts which are most exposed. Hence some argue for a Similarity between the Skin & Periostium. For the same Reason the Virus seizes the parts where there is but little flesh. Cold is a great enemy to its Cure & it yeilds more easely in Warm Climates, for warmth greatly assists in the Cure, and the Virus acts more powerfully in Cold Climates. Dr. Hunter thinks the Virus is made more corrosive by Cold. In Spain the Pox is accounted a trifeling disorder & treated with Diet drinks &c. and is Common for whole families to have it there. But in Cold Countries it is worse, not only because Cold Exasperates it, but also because Mercury cannot be used freely without some Danger.

Of the Colours of Bones. The Younger we are our Bones are the more black, therebeing Less of the Cretacious matter. One part of a bone is whiter than an other, and the Colour in different bones are various. Madder Colours all the bones of the body (which was found out by Accident) this it does in Young & Growing Animals in a few days but in old Animals the bones are hardly tinged in a month.

Bones

## Of the Bones &c.

Bones only are tinged not other white substances, as Cartilages, Tendons &c. Calluses also are coloured, when they have got cretaceous, for it seems to affect bony or earthy matter only. When the Cretaceous matter is extracted by acids the colour is lost. Bones will acquire the colour by being boyled with Madder, but Cartilages, Tendons &c. do not. Bones in some India Birds have Periosteum, and the bone is of a Natural Colour. Thus Chymical Analysis will be different according to the different manner of preparing them. Bones when the water is exhaled & the Oil extracted, yeild a Volatile spirit impregnated with Salt, then a thick fetid oil, & Caput Mortuum, when this last is further exponed the earth which remains is pure, the Gluten does not appear by this Process but is converted partly into Spirit by fire. Ivory Black is made of burnt bones. D^r. Slare says the earth is so pure that no salt can be extracted from it. The Quantity of Earth is as 5, to 9, & when every other principal is drove off, the earth remains as in Skeletons that has lain long in Vaults.

## Division of Bones.

Bones are very different in Form, the Common division is into the long Cylindrical & flat bones. We may divide them first into flat thin bones, as those of the Skull being of a compact Texture on both sides, & having a Spongy substance within. 2dly into a spherical or Cuboid as the Patella, the bones of the Carpus & Tarsus, with a thin cortical substance & Spongy within. 3^ly into irregular bones, as the Vertebra. Lastly into Cylindrical (tho' they are not regularly so being larger at both

both ends than in the middle) these have more of the hard cortical substance where they are small and more of the Spongy where they are large. The enlargement at their extremities makes the Joints larger, & therefore stronger, for the surface of contact will be greater and the friction on one part will be less, being diffused over a large surface; besides by this means the Muscles are removed from the Center of their motion, & consequently act with greater advantage, and have a more advantagious attachment. on the Contrary the middle part or Diaphysis is small to afford a convenient Lodgment for the bellies of Muscles. This middle part is weaker from its size & also from lying hollow; & Nature has endeavourd to compensate for this by giving a greater Quantity of bony matter to this part. Some suppose that there is the same Number of bony Threads runing from one end to the other, but there is certainly more bone in one part than another. D.r Haller in his Osteologia confirms this.

## Of the Processes of Bones.

Processes are distinguished by their figure. A Head is a round process with a long neck. Condyles are oblong Heads. Tuberosity signifies a rough knotty process. When a process rises to a thin sharp point it is called Coronoid. when into a thin Edge Crest or spine as Spine of Tibia. Brims of Cavities are called supercilia. What purposes do these processes answer? they give proper & Necessary Conjunctions they serve also in particular for the Motion of Bones, & to give convenient Attachment to Muscles. Processes from their Manner of formation are of two kinds. Apophysis & Epiphysis. Bones are first Cartilagineous Ond Bone from the beginning & then growing larger. Ossifications begin from the middle & then shoot out on all

hands

## Of the Bones &c.

Hands & meeting with their originals they unite & run into one another. Apophysis signifies a Production or Elongation of bone from the original ossification. Epiphysis is a distinct Assification being a Cartilage in young Bones. The Ossification begins in the middle of it & shoot out towards the middle bone.

### Of the Cavities of Bones.

Cavities are of two kinds, first for Articulation. 2dly for the Lodgment of soft parts. The round and deep Cavity for Articulation, is called Cotyloid, as the Acetabulum of the Os Innominatum, Scapula &c. The deep pits for the teeth are called Alveoli or sockets. Fossæ or Sinuosities are not Expressive of particular Cavities. By Sinus we mean a Cavity that has a small orrifice leading to it. A Foramen is a hole going thro' & thro'. A Canal is a hollow that is continued some way. A Groove is a sort of half Canal.

### Of the Articulation of Bones.

Articulation or Combination consists of two kinds. The Articulation & Connection, or first the form of parts to come in contact, & the Relation they bear to each other, & secondly the binding by some other substance. The terms were not used in so determinate a sense by the Greek writers as we use them. They being more conversant with the Joints of Beasts than Men: hence arises some confusion. The Joints cannot be ranged so particularly as to their Names as some would imagine, there being great variety in their shapes. Galen's Division is into Arthron the Joints or proper configuration of Bones to be adopted to each other; this also is of two kinds, one of which allows Motion, the other not: that which allows of

motion

Motion is call'd Diarthrosis, the 1st which does not Synarthrosis each of these he subdivides into three kinds. Diarthrosis in~~to~~ Enarthrosis which is when a round head is received into a deep Cavity: This allows more motion than any other kind, as Flexion & Extention in any direction, Rotation upon its Axis, & Conoid Motion; The Head of the Femur & the Acetabulum of the Os Innominatum make the only Joints of this kind. The second is a more superficial Cavity, with the Head flatter & is called Arthrodia which allows the same kind of motion as the other. The Os Humeri & the Acetabulum Scapulæ make a Joint of this kind. The third species is Ginglimus or hinge like Joint. When there are processes & Cavities mutually receiving each other. This admits only of flexion & extention as the Joints of the knee, and the Articulation of the Ulna & Radius with the Os Humeri &c. Synarthrosis also be divided into three kinds, without motion: 1st into Sutura & Raphe as in the skull: 2dly into Harmonia when two thin bones overlap as the Temporal & Parietal Bones: there is an other kind which is when a thin bone runs between two thicker; 3dly into Gomphosis when one bone is fixed in a deep Cavity of another, like a Nail in a board, as the Teeth in the Sockets. The Connection of bones according to him are of three kinds, Synostosis, Syncondrosis & Sysarcosis. The advantage & Disadvantage of Joints with motion balance one another. The Weakness and confined motion of Joints is disadvantagious. When Strength is required there is less of motion, & Vice Versa, as in the Thigh & Arm. Strength & free motion are two advantages of Joints, but is very difficult to have both these, for they are almost incompetable with one another.

The

# Of Bones &c.

The Diseases of Joints are Luxations, or Compleat & Sublux-
=ations or incompleat. The first is when they are entirely
thrown out of their places, the 2d when they are only partly
thrown out. Writers say that in the Enarthrosis, & Ball and
Socket there cannot be a Subluxation, because if it partially
Luxated, as with the Head of the bone on the brim of the Socket,
yet upon the least motion it will either slip in or be more
compleatly luxated; but it may either happen in a Ging-
=limus Joint, from side to side, but not forwards and back-
=wards. An Anchylosis is when the Joint becomes stiff; of
this the partial sort is sometimes curable, but the absolute
(which is when bones grow into one another) is incurable.

# Of Cartilages.

Cartilages are Demiopaque Substances, with some degree
of Elasticity. There are three Cases, 1st. Those out of the Joints
that are found in Adults, as in the Nose, Ear & Trachia Arteria
these supply the place of bones, with this advantage that the
part is more moveable, & yet it retains its shape, 2dly those
which supply the place of bones till it can be formed, &
are found in the Infant state only on the Ends of their bones;
3dly the Cartilage now cruth that cover the ends of Bones, which
move one upon the Top of an other. Cartilages are covered with
a Membrane called Perichondrium, which Authors say is
of the same kind as the Periosteum. This is true in the
Cartilages of Adults, & in the Fœtus also, except in the
Cartilages of the Joints, where there is no such Membrane,
it being most probable here that the Cartilage is covered
with

# Of Cartilages.

with a reflection of the Internal membrane of the Capsular Ligament of the Joint, both in the projection & Cavity of the Bone. The Structure of Cartilages is different from that of other parts, not appearing to be fibrous or Vascular, but rather like a Concretion, like a piece of Wax or Cheese. The Structure of the Cartilages in the Joints is fibrous, & the fibres rise in a perpendicular direction to the surface of the bone like a pile of Velvet, as appears from preparations. It is not true that Cartilages have blood Vessels like Bones. In the Cartilages of young Animals where they supply the place of bones there are blood Vessels, but those of the Joints do not appear Vascular from finest Injections. Their Borders are Vascular, but the Vessels disappear in the body of the Cartilage. D^r. Hunter believes them to be Vascular, tho' the Vessels can't be seen or injected. In the Philosophical Transactions, the D^r. says that the blood Vessels run under them in order to be preserved from friction; but he found afterwards that it was the remaining part of the Cartilage on the end of the bone, which was not yet ossified, but being injected gave this appearance which deceived him. Cartilages are insensable.

The Use of Cartilages. In the Trachia &c. it has been explained. In growing Animals it is to answer the purpose of bone till the bone is formed, and in Joints it prevents Abration, for bone would otherwise rub each other down. From its Elasticity it diffuses friction, and also breaks the force of Collition; by its insensability we have no pain from the Motion of the Body. Cartilages bear pressure better than any other part of the body, and are less liable to diseases, than even bone itself.

They

# Of Cartilages.

They also exist pressure as in the Case of an Aneurism, where the Coats of the Artery, Cellular Membrane, Muscles, Bone and Periosteum, and at last the skin were destroyed, and it got between two of the Cartilages of the Ribs, tho' these were not sensibly affected. Cartilages do not granulate or throw out fleshy fibres, nor do they exfoliate; tho' they are sometimes Corroded & at other times grow thicker & softer. ——

# Of Ligaments.

The Ligament between the bone are of the same sort of substance as Tendons; the one binding bones together the other binding Muscles & bones. Ligaments is elastic & strong, whence Joints are not subject to dislocations. Tendons are smoother on the outside than Ligaments, because they are more moved. With regard to their Vessels & Nerves, it is presumed they are the same. Ligaments constitute the Periosteum as well as the Tendons. Tendons, Ligaments & Dura Mater, have always till of late been thought very sensible, from Galen downwards, being supposed to be plentifully supplied with Nerves, and that when inflamed they Suppurated unkindly, and did not heal well. But that they have little or no sense is without all doubt, by the Experiments of D. Haller. The Case of Mr. Bamby seems also to prove it who having a violent Inflamation upon his finger, & being in great pain, cut the Flexors of the finger, & was not sensible of the least pain. Haller's Experiments do not perhaps prove that these parts have, but that they do not seem to have feeling to an exquisite degree. This doctrine of Insensibility arose from the misunderstanding of the Greek Word: for the Word with them signified not only what we call Nerve, but Tendon or Ligament also, even now we use the word Nervous to signify Strong.

# Capsular Ligament.

The Capsular Ligament is a connecting Medium between two bone making a sort of purse or bag surrounding the Joint & Confining the Liquor in the Joints. It consists of two Lamilla different in their Nature & Origin, an external & internal, the external gives strength & is a continuation of the Periosteum from one bone to the other, the internal is a fine smooth bag of a dense close nature, like the

Pleura

# Of Capsular Ligament

Pleura & Pericardium, & where it is said to be inverted into the bone it appears vascular, and tho' it seems to be lost in the begining of the Cartilage, yet it is probable that it is continued back again over the Cartilage, making the Pericondrium being what is called a reflected Membrane (This Membrane lines all the Cavities of the body, as the Pleura, Peritonæum, Pericardium &c.) the inner Lamella then of the Periosteum, terminates at the Cartelage, but the external lamella goes over the Joint. The Capsular Ligament is said to run in between the Epiphysis & Bone, but this it certainly does not. The Use of these Ligaments is first to keep the bones together, 2dly to confine the motion only permitting it to go a certain way. 3dly to confine the Mucus of the Joint to its proper cavity. Great strength is in the outer Stratum to answer the two first purposes, the third is answered by the inner stratum, when motion is in all directions, as in the Arthrodia, the Capsular Ligament is nearly strong all round, but when the motion is only flexion and extention, the greatest strength is placed on the two sides, the bending & extending being thinner. 'Tis common for Tendons to degenerate into one thread themselves upon the Capsular Ligament, by which means they are not pinched or catched by the Bones. The Ligaments of the spine are elastic, (tho they are generally inelastic in other parts) resembling white Leather

# Of Dislocations.

Dislocations from internal causes, as from relaxation or a disease of the part may by easely reduced, but these kind seldom occur. From external causes the capsular is commonly burst through; this is evident from experiments on dead bodies (for the same force after death will be sufficient to dislocate any part as when living) when the Capsular Ligament is found injured according to the degree of dislocation, and also from the difficully of reducing dislocations at sometimes, and the facility at others; this difficulty seems to be occasion'd by the strong action of the Muscles, but as they are not spontanious actions, it is from the Capsula, for when the Capsula is lacerated much, it is the more easely reduced, but when it is only burst sufficient to let out the head it will be more difficult to reduce it, for the more we stretch it the resistance will be the more 'till it is burst larger; yet sometimes it will slip in afterwards without any force, from a very simple Motion as in the Example of a Man at St. Thomas's, and also Example related by Mr. Gorle when the bone slipt in by only hanging the Joint.

# The Synovial Glands.

The Synovial Glands are met with in all Joints that have motion. They are placed like pieces of fat in the Cavities of Joints, so as to be gently touched by it, but not too much upon their situation, figure, Size & Number will be according to their different Configuration of the Joint. In the Joints of the Knee the largest Glands are between the Condyles of the Femur and under the Ligaments of the Patella.

Their

## Of Synovial Glands.

Their Ducts are not visible, nor does any Liquor pour out upon Squeesing them. They appear to be rather Vascular than fat in other parts. This Mucus may be obtained from all the internal surface of the Capsular Ligament, which is very Vascular & some oil is probably mixed with the Juice. Synovia is very Slippy & Ropy, and the best calculated to make the parts Slippery, this like the liquors is constantly absorbed, for Collections of it the Joints will suddenly disappear. Diseases of the Synovia. It is said to become watery, thin & corroding. Inspissation it is said to be subject to, but from Mr. Hunters Experiments, it does not seem to tend to Inspissation, & Mr. Hunter never found it concreted in the number of Joints he opened, it does not require the Motion of the Joints to keep it Fluid. ———

## Of Osteogeny

Bones are not formed from the begining, but at first are Gristly. The common Doctrine is that they Change in hardness, is Gradual, that is, first like Jelly, then Gristle, then Bone, but besides this some have added the Acquisetie of new matter, the same as wood petrefied, they say that bones begin to Ossify in the Middle first, from the pressure of the Muscles, & they say that this is possible, because it is observed, that a Strong Child has its bones sooner Ossified; they say also that Bones may be reduced to a Jelly by keeping them in an Acid. Dr. Hunter thinks this way of accounting for Osteology is false Dr. Nesbit thinks that pressure upon a part will not produce a Bone, & that there must be a considerable Quantity of earth in Bones, and that a Cartalage will not become a Bone by the thinner parts being pressed out. Pressure on other parts does not produce Bone

besides

besides these parts which have most pressure do not begin to Ossify first, for the Cecula Auditus is very early Ossified tho not exposed to any pressure. Gristle does not seem to be converted into bone, but to waste away as the bone is formed, for when a young bone just ossifies or is soaked a little, & the Periosteum taken off, the Gristle falls off from the bone, & the Vessels of the bone do not communicate with those of the Gristle, it being a connection rather than a Continuity of the bones. Bone seem to be a peculiar distinct substance, & the fibres shoot in different directions, as in the Skull the Bones shoot out in Membranes from the Center to the Circumference. What remains after steeping Bones in an acid is the Jelly or Gluten & the Vessels of the bone. In the Patella the first beginning of Ossification may be seen, for the Vessels of the Cartilage become first Ossified, shooting out like white Coral. In flat Bones the Ossification is in the Center at first and the fibers are radiated. In the Bones of the Carpus & Tarsus, the Ossifications is surrounded by Cartilage: in the Cylindrical Bones the Ossification begins early, & the manner is not easely determined. In the Irregular Bones (for the regular are formed from one Ossification) that are large, the Ossification begins in several places, so as to finish the formation the sooner, the fibres shooting quaque Versum. Thus the os Innominatum begins with three Ossifications. The part which is at a great distance from the beginning of Ossification, has a distinct Ossification, & makes the Epiphyses, tho in some places there is no Epiphysis where we might have expected them. But Epiphyses are formed perhaps that the Joint might the sooner become strong; several whimsical Uses have been given to Epiphysis, as upon the account of Capsular Ligament, & to restrain the growth of bones, but this is not true, for in this case Nature would have placed them at the ends of all the bones, which is not the case. It is said also that Epiphysis were of use in time of birth, but this is not true, for at that time there are no Epiphysis, they begin in a Cartilagenous state, and may indeed be of use to prevent Injuries from happening to the Bones.

Of

# Of Bones in Particular.

The Bones of the Body have not a perpendicular support bearing upon one another, so that the Skeleton cannot stand of itself, but this must be done by muscular Motion, therefore it is that an action or posture becomes fatiguing. Constant action if simple is fatiguing and requires intermission, this may arise from Uneasiness occasioned by obstruction; in proportion to the Weight in every attitude a certain Number of Muscles must act, & as this tires us we must shift the attitude. When at full length in bed Uneasinesses arise from obstruction & not from Muscular Motion. The Skeliton is a preparation of the Bones, and in Grown animals it is the best method, as their Bones do not loose their shape by drying, but those of Young Animals must be preserved Wet, because many of their bones being in a Cartilagenous State would loose their shape if dried. Nesbet & Albinus give us the shape of a Childs Bones in a Natural State. A Natural Skeliton is when the bones are connected in their Natural State by Natural Ligaments, the advantage of artificial Skelitons is that they are cleaner & that the figure of the bones may be seen better than in the Natural State, and their situation is as well or better preserved in the artificial one than in the Natural; in young or very small animals the Skeliton must be made the Natural way. The Skeliton is divided into the Head & Trunk including the Neck & Extremities. The Trunk reaches from the Head of the Thigh bones to the Skull, and may be divided into Spine, Thorax & Pelvis. The Spine consists of all the Vertebræ, & Sacrum & Os Coccigis.

The

The Thorax is made up of the Spine behind, the Ribs on the Sides & the Sternum before. The Pelvis consists of the Os Sacrum and the Os Coccigis, Ossa Illium, Ischium & Pubis on the sides & before. This division is nevertheless inaccurate as the Spine makes a part of the other two.

## Of The Spine.

The Spine is the long Pile of Bones extending from the Os Occipitis to the end of the Rump, in a fore or back View it appears small gradually upwards & downwards from the Os Sacrum, & there is said to resemble two unequal Pyramids; in a side View it appears curvated, but before & behind rather streight, its Incurvations are alternate, this allows shape in the Pelvis, in the Loins it swells forward to be nearer the Centre of Gravity, in the Chest it falls backward to give greater Cavity to the Thorax. The Spine is divided into True & false Vertebræ, from the Os Sacrum to the end of Os Coccigis, they are called false, because the admit of no Motion. The General construction of the Vertebra, is a middle oval gross part projecting forward called the body, making a pritty smooth Column, next a Process called Spinal, one on each side the transverse, & also the Articulating or oblique Process. The back of the Spine is very irregular. Between the body and the process is a hole, thro which the Marrow passes down. The Spine at its upper part answers the Femur Magnum, thro the Marrow passes down it sends off Nerves on each side between the Vertebræ. The body of the Vertebra forward is equally thick, on the two sides it is rounded forwards in a Longitudinal direction

but

# Of the Spine.

but in the transverse is hollowed before. The external bodies is of harder bone the internal is porous; the distance between the Vertebra is filled up with Cartilage; and the posterior part of the body of the Vertebra makes the Anterior of the Canal for the Marrow. The processes from the lateral part of the body of the bone shoot backwards, & makes a ring that is the Bases of the other processes. The process that runs directly backwards called the Spine is Azygos; but there is a pair of transverse Processes one on each side which serve for the Attachment of Muscles; at the root of the transverse are the two articulating processes on each side, which are covered with flat Cartilage & serve for the connection of the Vertebra, the upper have the articulating surface backwards & the under have this forwards, the under are very much blended with the roots of the transverse process. A lateral Notch may be observed on the under side where the Nerves pass out. Between the bodies of the Vertebra is a Cartilagenous or Ligamentous substance, this intervertebral substance is made up of two Cartilagenous crusts covering it; there is likewise a ligamentous substance going from one to the other; this is made up of Concentric plains of fibres which are tough & tendenous on the out side, & more Glutinous in the middle (in the middle of a Cartilage in a Whales Vertebra Dr. Monro discovered a Bag of Watry Jelly Vid. M. Ps) these plains of fibres crop one another like the letter X. The motion will be that when the Spine is bent forwards, the bodies will be brought nearer each other, & the substance behind will be stretched: & both compressed and stretched will tend to bring it to its natural State. The

# Of the Spine.

The Spine is bended also from side to side, tho the Joint does not admit of much motion. The spine proces is of Muscles. They lie over one another to prevent sharp Instruments from Inpuring the Medulla Spinalis D^r Monro Just. The Vertebræ are connected laterally by the Articulating proces & they play upon one and the making a regular Joint, when Stretched behind the proces must draw a little way from one another, & Vice Versa. The Spine is supposed to have a twist, but this chiefly in the Neck. The Vertebræ beside the Capsula have a ligamentous Sheath in the Canal, before the Bodies of the Vertebræ, & between the proceses. A Man is an Inch shorter in the Evening than in the morning, from the pressure of the Intervertebral Cartilages. The remarkable white leather ligament is at the root of every spinal proces, the Use of it is perhaps to draw the part together by its elasticity, in the place of Muscles, for muscular motion in that part would be very fatiguing; in the Neck of a Calf it assists to pull the head up, by being fixed to the head & Neck as Hunter shewed in a Lyon's foot dissected. In Lyons & Cats there is this elastic ligament, that goes from the Toe to the Claw, & by its Elasticity keep the Claw up when inactive, this action of the ligament is involuntary & constant. The bodies natural weight tend to bring it forwards, from the Situation of the Spine & this ligament, by getting on the Spine and drawing it back helps to keep the body erect. Next come the body of the Vertebræ & their particular discriptions for which Vid. Monros Osteology. Reflections on the Spine &c. As the Spine is to be a support to the body it is a fine composition, both for support & motion, & also conductor & protector of the Spinal Marrow, hence it is made of a number of Pieces.

# Of the Spine.

If there was but one Joint there would be but little motion, if one in the Neck & another in the Loins, then there must have been considerable motion in these Joints, which the Spinal Marrow would not allow of, besides it must have been compressed. As the Spine supports the body in various Inclinations there is a broad surface of contact between the Vertebræ, & the ligaments are very strong. It is always true, that as the motion in each Joint is little the Strength will always be the more. Those muscles that bring the Body back must be Stronger than those that bring it forward, for those that bring it forwards must act with a length of Lever for several Inches, whereas those that pull it back lie nearer the Center of Motion, & therefore act with less power. —

# Of Incurvations of the Spine.

The Rickets (tho said to be wrote of first by D^r. Glyson) in all probability alway existed. When the Spine does not appear by looking at it behind & before, we must look upon it as Diseased. Animals as well as Vegitables tend to grow streight, but are often prevented. Havers & Glyson say that the Spine is crooked from the bodies of the Vertebræ being thicker on the one side than on the other, or from the Growth being stoped on the one side. 'Tis said also in a crooked Leg the Convex part is less hard than the Concave. D^r. Hunter thinks it is rather because it is unequally compressed. Others think it may be for want of Nutritious matter on the thin side. D^r. Mayo supposed that it might be because the muscles were tighter on one side than on the other, & so pulled the body to that side, it not being in Equilibrio. Just as if a Growing Tree was tied down.

He

He says also that where the Muscles are stronger the bone will be concave & Vice Versa: But D.r Hunter observes this cannot be the case, because the Muscles run over the Joints. The truth is that the bones of Richety children are soft for want of a due proportion of Earth, & their Joints are spongy: in this constitution, they cannot support the weight of the body, Hence those bones which are to support it will become crooked. That Incurvations are not from a want of Osious matter is evident from a crooked spine the D.r here shews us, in which the Osious matter has been squeesed out, in that side where the bodies of the Vertebræ were thinnest forming irregular bumps Why do they make a curve to one side? this is accidental as the child happens to incline more to one side than the other from Circumstances and When a curve is once begun it goes on; Why is there more than one Curve? If a Curve is once formed the Center of Gravity is thrown on one side and makes a second, which proceeds from an endeavour to keep the body in Equilibrio. In Infants the bones become soft before they take a turn, and afterwards grow hard in their diseased State. Why does the Richety Childrens legs bend sooner than the spine? D.r Hunter supposes it is because different bones come to maturity at different times of life, thus the Clavicle is compleatly formed at Nine months when the Child is born; the bone of the leg are not Ossified before they begin to walk; Cartilages will not bend & thus the small part of the Tibia bends first being weakest & first Ossified; the Vertebræ do not acquire their Bony texture until for 10 Years, and are prevented from having this curve partly by having Cartilagenous Crusts; this will account for people having Crooked Legs &c. without

# Of the Spine.

Without a crooked Spine or other parts which are later in offering. One may perceive when a Rickety Child is likely to be crooked on its bones, by feeling the Ends of the bones at the Wrist &c. which will be larger than common, & also when the ends of the bony parts of the ribs join the Cartilage there will be Knots. How is the Disorder to be prevented? If we can mend the constitution the beginning may be got the better of, Cold Bathing ought to be used above all other things. Dr. Hunter thinks that Teething & its symptoms should not forbid the use of it; clear open Air, Exercise & keeping Children airy &c. is of much service also. Medicine or Diet will avail but little in preventing the Rickets; if the body bend forward Stays may be of service, if Angular behind Pressure may be of Service, but when from side to side they would perhaps do harm. An Incurvation at one place in Adults happen sometimes with Palsies on that side, thus Palsies come on gradually & then the Incurvations which are generally in the dorsal Vertebræ are discovered afterwards. The Bowels become sometimes paralytic, & the Bladder is affected, but most of those die who some of them recover. These disorders begin from Strains or diseases which cause suppuration, & the Matter confined in, the bones becomes carious & the Spinal Marrow is at last affected, except there is a vent for the Matter, & the bones are but little affected, they cannot recover. If the Palsy happens to one, we would little expect, we should examine the Vertebræ. If the matter points outwards we should certainly let it out, but if it does not, we should endeavour to support the superior part in a swing Chair, when the Head & Breast are supported by slings, in any tendency of the

Spine

# Of the Spine.

Spine to bend, the Legs should be kept always at full length by high heeled shoes &c. Mons. Sen. cured two Cases by counteracting the Cause, he made a Woman who had curved her Spine by quilting always on one side chairing her side to quilt. A Child who used always to play on one side of his Chair, he made play on the other. —

# Of the Spina Bifida.

The Spina Bifida is a soft Tumour our Children are often born with on their backs; it comes from the Spinal Marrow higher or lower, but generally affect the Lumbar Vertebra. This Tumor contains a watery like mucus, coming from the Spinal Marrow, & often the Cauda equina is pushed into a bag. sometimes the Integuments go quite over the Tumor, often not. but then there is a Cicatrix instead of them; sometimes it is burst through sometimes not, when it is not it is very evident. The Spinal process of the Vertebra affected is wanting & a double Ridge appears. We had no account of this tumor before Talpius. Before the nature of it was known Surgeons used to open it, & the Child often time died under the operation. Recovery is scarce possable; tho the D. tells us of one that lived 20 years. This man grew stupid upon standing long erect, but recovered upon lying down. The D. thinks this was owing to the accumulation of water in the Bag from the Brain & leaving the Brain destitute of pressure, & the sound when the bag was pressed too much & the fluid pressed up too strongly he became stupid again, so that this argues, that the brain requires a certain degree only of pressure: 1760 M.D.

Subluxations often happen in the cervical Vertebra. Mons. Petit gives an account of a Child who died upon being lifted up by the Head. The Earl of Clair fell from his Horse & his Head was turned round in

Shoulders

# Of the Spina Bifida.

Shoulders. his servant twisted it into its place after making an Extention. D.r Franklin told D.r Monro of an Instance in which a Man had subluxated one of his Cervical Vertebræ. Tho it was set again, yet he never had the use of any part of body that depended upon the Spine or the Nerves below the Subluxation. Tumors from Luxations are different from others & the Symptoms are more sudden & fatal. The Method of reducing a Subluxation is first to make an extension. Then turn the body raising at the same time.

# Of the Thorax.



It was called Thorax from its defending the vital organs, as the Heart & Lungs which are placed in it, & it is very properly so called, and it is not so much to defend these organs as to assist the Lungs in Respiration. The Thorax is composed of the dorsal Vertebræ behind the Ribs on the sides and the Sternum before. There are commonly twelve Ribs on each side tho D.r Monro has an instance of but 11. Heart it should be said the 12.th was lost he has preserved all the Muscles below the 11 where there is no appearance of a Rib. The D.r also found 8 true Ribs in three Sterna out of 12 & thinks they are not so rare as is immagined tho there are but 8 Generally. The curve of the rib follow the crookedness of the Spine for the side where the Spine is hollow, the Ribs will be nearly together & where it protrudes the Ribs will be at a great distance. The projection will be occasioned by the Spinal process & Angles of the Ribs, the Ribs are affected in consequence of the Spine which must affect the health, but as this is gradual the parts accomidate themselves. The principal Viscera will be less as the Cavity is so. The Ribs of Children are formed at Birth, that they may carry on Respiration. The Ribs shew a Rickety Habit of body as soon as any part, when the fulness appears in one part only the habit is not Rickety. We may prognosticate that such cases will not increase & grow worse. Fractures of the Ribs is not so common as is immagined, they having a Considerable Spring or Elasticity. When the fractures do happen the Calous will be found to be smooth on the inside of the Rib from the motion of the Lungs; the Bump will be on the outside; all the ribs are sometimes anchylosed with the Vertebræ. Monro has a Case where the Ribs are immoveably joined to the Sternum & Vertebræ to the Os Innominatum. This person must have lived by lengthning the Thorax. The Reason why the Ribs were upwards is because they are fixed to the Sternum above & by moveable Cartilages below. Monro has a Thorax in its natural Situation,

which

# Of the Thorax.

which be prepared by keeping the Ribs apart with wire, before the Intercostal Muscles were dissected. & by keeping the Spine in a frame so that the Cartilages between the Vertebræ could not Yield.

Sternum. Its points of ossification are many in beginning, they decrease to two. the uppermost is about two Inches long, and is of the shape of a ~~Card~~ Cards Heart. & the Cartilago Ensiformis is often depressed so as to give pain cause Vomiting & Sickness & other terrible Symptoms. Martang gives an account in which, when he had raised the Cartilage the Sickness went off and the pains ceased &c it is raised sometimes by a Strong Sticking plaister suddenly Jerked up. If the Symptoms should be very alarming. Monro thinks it should be cut out (not being essentially necessary notwithstanding it connection with the Diaphragm &c but such cases nearly or never happen. But for a more particular discription of the several bones of the Thorax see Monro.

Of Respiration. It consists of Inspiration & Expiration, the first is when the Lungs are expanded by Air: the last when they are in their collapsed state by the contraction of the Ribs. This motion is very compounded. the Joint at the Angle admits rather of a Rotation on the Axis. & by raising the Anterior Extremity enlarges the cavity of the Chest. by this motion the Sternum is raised and pushed outwards, by its lower end chiefly. But in weakly Children the Breast does not expand outwards, for when the Muscles pull up, the Anterior part of the Breast will sink instead of being expanded, from the pressure of the Atmosphere. the parts being too flexible. The Thorax can be inlarged in every direction in Length, Breadth, & Depth by the lifting up the Ribs by their curve. in Breath by the same curve & their rotatory motion.

All inflamed part are agrivated by being stretched, therefore in Pleurisies an bandage applied very tight to the Thorax so as to prevent the motion of the Ribs, will give ease to the patients.

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# Of the Thorax.

The Diaphragm & Abdominal Muscles being sufficient to carry on Respiration as in Monro's case. Very tight Stays must do great Injury to those that wear them by hindring Respiration. The Thorax can support great Weight during Inspiration: 600 ℔. was supported by an Artist. D^r. S— saw ℔ 700.

# Of the Pelvis.

The Pelvis is a firm composition of Bones going all round the Body resembling a Bason, or making a strong irregular Circle, perforated below, and having the bones raised on the two sides. From the Brain downwards is strictly the Cavity of the Pelvis. The Pelvis is very strong because it is situated at the lower part of the Trunk & contains and supports the Abdominal Viscera. It is placed over the Thigh Bones making the point or centre of some of the most considerable motions of the body, and also because it affords a firm Insertion of a great Number of Muscles which require much bone. All the immoveable parts of the body are placed asunder, but it was necessary that this Extent of bone should be connected all round on account of the numbers of Muscles which come to it from all parts. It is absolutely necessary that the Pelvis should be hollow both in Men & Women for holding the Contents. & that it should be perforated to afford an Exit to the Fæces, & the Contents of the Bladder & intestinal Canal. The back part of the Pelvis is united to the back bone behind to give attachment to Muscles & a passage to the Spinal Marrow. The sides are suited to the

Thighs

# Of the Pelvis.

Thighs to support the body when we sit. The fore part is suited to the lower part of the Abdomen Organs of Generation &c. A great extent of Abdomen was required on account of Respiration. The Situation of the Pelvis is different from what we think. The line that divides the Pelvis from the Abdomen, is marked out by the Os Pubis, & a Circle that is made by the Os Ilium & Sacrum. At the bottom it is irregular with three projections making almost an equilateral Triangle, & three Notches, one for the parts of Generation before, & one on each side for the blood Vessels & Nerves. The Pelvis is placed obliquely; its axis is directed upwards & forwards; the Os Pubis is downwards & forwards; the Os Sacrum is upwards & forwards; the Tuberosity of the Os Ischium is downwards & backwards. The Os Coccigis is almost directly downwards. The Reason of this obliquity is that the Acetabulum in this direction will be directly over the Thigh bones. The Pelvis is composed of a posterior azygos part, the Os Sacrum & Coccigis & two lateral & fore parts called Ossa Innominata, each of which is divided into Ilium, Ischium & Pubis; for a Description of which see Monro's Osteology. The Os Coccigis in Men answers to the Tail in Brutes. Bourgarius, Harvey in his book on Generation thought Fishmen had Tails, & other People in Borneo also. The Male & Female Skeleton are said to be distinguished by the Pelvis: but this no certain mark. In Men the bones are perhaps stronger & less delicate & have marks of Muscles more plain. Neither do the Clavicles or flat make of the Chest determine the distinction. The Pelvis indeed is generally the best Rule, the Cavity of which is commonly larger in Women than in Men. The three points below are at a greater distance in females which is most remarkable in the Sciatic Notch. The Breadth of the Pelvis in Men should be a third less than their shoulders,

# Of the Pelvis.

In Women a third more say the Statuaries, but this too great an allowance. tho Womens Pelvis are certainly larger & thinner. A narrow Pelvis is a great cause of a difficult Labour. Julius Cæsar says Aurantianus was the first that took notice of the cause of unhappy Labour. from the narrowness between the Os Sacrum & Pubis. Labour should not be forced hastily. for Nature will often relieve herself by altering the Head of the Child. which will form its self to the part through which it is to pass. for the Head will become considerably lengthned & both mother & Child do well. Nature ought never to be forced where the Patients strength is sufficient. pains that go off for a little time are the best that can happen. Rest is of great consequence. When a Woman has strength she is safe: tho in a crooked or uncommon Pelvis there may be hard Labour. yet a crooked person may have a good Pelvis. Distortions happen sometimes in one part sometimes in another when many other parts are quite straight. Deliveries when hastned are oftentimes attended with ill consequences. Instruments are but seldom useful tho sometimes they are absolutely Necessary. c

# Of the Upper Extremities.

The Upper Extremities are all that are moveable upon the Trunk of the Body. viz. Scapula or shoulder, Arm, Fore Arm & Hand. The shoulder consists of Clavicle & Scapula. See Monro. All Animals that use their fore feet much have Clavicles except the Lyon & Cat which have none.

The Arm consists of but one bone, Os Humeri. Its Motion is first on the Scapula 2. with the Scapula. On the Scapula it has Flexion & Extention in every direction; & with it the conoid Motion & Rotation on its Axis. The Motion of this Joint is not so large as we may imagine, for the Scapula is connected in all the large motions. In a Dislocation of the Shoulder the Os Humeri is thrown inwards & forwards, and when we find a hollowness under the Acromion, the bone must be dislocated. This is the only large Joint we choose to Amputate. In the Amputation the Arm should be kept close to the body, when we mean to come at the Joint on the top, but it must be extended when we mean to cut upwards. In Cases of Surgery that are dubious we should not give a hearty Judgment but examine carefully first.

The fore Arm consists of Radius & Ulna. These two bones make a fine piece of Machanism. for their figure, Motion &c. See Monro.

Reflections. Why is the Ulna larger at Top & the Radius at bottom? Because the Ulna has the principal connection with the Os Humeri, & the Radius with the Carpus. The interosseous Ligaments has fibers runing obliquelly from Ulna upwards & outwards to prevent dislocations. In Fractures of the fore-Arm it should be bound up with the Hand in the Middle State. There are two bones in the fore-Arm for the sake of Rotation & for the sake of the Hand, these advantages —

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we could not have without a loose Joint, which therefore would have been weake: Tho there is a greater breadth there is more room for the Attachment of Muscles. Why do the Flexors come from the inner Condoyl & go downwards, & the Extensors come from the outer Condoyl & go downwards and inwards? Because they run down straight when the Arm is put into a natural middle state. & do not appear to have the oblique direction which one would be apt at first to imagine. The Thickness of the Radius & Ulna is greater at the Ends, than at the Middle, That is they have more Osseous matter, or thicker lamella there, which is not the case with other bones. Do the Radius & Ulna move on each other? or is the Rotation owing to the Radius only? Monro thinks it is owing to the Radius only, & that the Os Humeri contributes much to the Motion of the fore-Arm. The Action of the Quadratus Pronator is to move the Radius only; for a Muscle arising from one bone and inserted into another does not move with bones.

A Subluxation of the Elbow sometimes prevents. It may be distinguished by the Olecranon being higher than Usual if externally luxated: Subluxations Internally rarely happen: Tho D^r Butt saw one where the Olecranon was drove inwards & was felt upon the Biceps Muscle. Dislocations of the Wrist are very rare.

Fractures of the Radius are more common than of the Ulna and are more difficult to cure, contrary to the common opinion. They generally towards the upper part of the Radius even if the force is applied below. E D^r M.

# Of the Bones of the Carpus.

The Hand is divided into Carpus, Metacarpus & Fingers. The whole is hollow within & convex without for grasping any thing; and this is naturally the easiest position when a little hollowed. The Carpus is composed of eight small bones, which are divided into two ranks. The first rank lies next the fore-Arm & consists of four bones, Scaphoides, Lunare, Cuneiforme, Pisiforme. The second rank next the Metacarpus & consists of four also. Trapezium, Trapezoides, Magnum, & Unciforme. In both these rows We begin to count from the side next the thumb. The Metacarpus is between the Carpus & Fingers & consists of four bones without including the thumb. The Fingers & Thumb are very similar. Each Finger consists of three bones & has three Joints growing gradually smaller & shorter making a Pyramid. But for a discription of all the bones see Monro. The Hand is a delicate Machine & Galen in his principal work begins with the Hands as having the greatest marks of intelligence & design. From the Nature of the Joints the most easy situation is between Flexion & Extension making an Angle. In the Hand there is a great Cooperation of Muscles from a Number of Joints. The Number & Variety of the Joints will afford convenience for various and large Muscles.

# Of the Lower Extremities.

The Lower Extremities are partly analogous to the uppers; tho they have a part like the Scapula except the Os Innominatum which belongs to the Trunk. The lower Extremity is divided into Thigh, Leg & foot. In the Thigh there is but one bone, called Os Femoris See Monro.

A Fracture of the Neck of the Femur is supposed to be often mistaken for a Luxation; tho it is certainly often luxated. For a dislocation the Knee be turned outwards, the head of the bone must be before the Acetabulum or behind it: if the bone is before the Acetabulum it will be felt in the groin; if behind it the Trochanter will be nearer the Spine of the Ilium; but if it be above it will be much shorter. This shortness will be owing to the contraction of the Muscles particularly in Scrophulous Cases, in which it cannot be so certainly determined. Monro relates an Instance of a Thigh bone being luxated & making a new Acetabulum in the Os Innominatum. In Fractures & dislocations we should consider the direction of the bone. Amputation in this Joint has been recommended by the French. In Incurvations of the Thigh Bone, its head will be found to be lower than the great Trochanter: the Bone will also bend outwards & forwards: this arises from a Want of Osseous matter. The principal Medullary Artery enters the Os Femoris obliquely upwards, but it enters the Os Humeri downwards, the fore-Arm upwards & the Leg downwards.

# Of the Bones of the Leg.

The Leg is a part that answers to the fore-Arm, and consists of two long bones the Tibia & Fibula & a small roundish bone the Patella. The Tibia and Fibula are nearly of the same length. The Tibia only is connected to the Thigh bone: the Fibula is on the outside & a little more posterior by than the Tibia. The Patella plays upon the Os Femoris something like the Anconeus on the Os Humeri, but being a seperate bone is not in so much danger of being broke. The Femur has a little rotation & likewise by means of the Patella the friction is taken off which must otherwise

# Of the Bones of the Leg.

otherwise happen to the tendons acting like a pulley. See Monro. What is the Use of two bones in the Leg? Not for Rotation as in the Arm, but the principal advantage is to afford a greater boney surface for the attachment of Muscles; & from this Extent of surface, we have a great number of Muscles for a great variety of Motions. The Tibia gives the principle strength. The transverse fracture of the Patella happens not from the Strength of the Muscles, but it is broke as it were on a Fulcrum, the Muscles pulling each Way. The Ligament is also sometimes Ruptured. The Patella may be broke by a Sudden Flexion. The Muscles entering it are stronger above then below, therefore it is pulled up & broke upon the end of the Os Femoris as a Fulcrum. When broke it is to be cured by keeping the leg extended one Week or more (which may be done without any danger of having a stiff Joint.) then move the Rotula back=wards & forwards with your hand gently & constantly; then by degrees bend and extend the Joint holding the Patella, and not with Mr. Warner keep bending it from the begining, or as others, keeping it always extended till you have an Anchy=losis. N. E. D. M.

# Of the Foot.

The foot is similer to the Hand, & is divided into Tarsus & Metatarsus & Toes. The Bones of the Tarsus are Os Calcis, Astragulus, Naviculare Cuboides, Cuneiforme Internum Medium & Externum. The Bones of the Metatarsus & Toes are of the same Number as those of the Metacarpus & Fingers. For the Shape conection &c. of all the Bones see Monro. There is much difference betwixt the Hand and foot in Shape & Strength. The foot is first of all hollowed & the Basis of the Toes goes upwards; from Os Calcis to the Metatarsal Bone the Arch is made convex above & concave below. We may suppose three reasons why the foot is hollowed, 1st There is space to lodge soft parts & a Winding Cavity through which are conducted Nerves & Blood Vessels &c. 2d The arch affords greater Strength, the Bones being thrown & bound together by strong Ligaments, 3d on the hollow side is the great Strength of connecting Ligaments which support the Arch — Great mischief generally follows wounded Joints or Tendons of the foot as these substances heal unkindly & cause great Inflamation. Some part of the Os Calcis may be cut away and the foot saved; but the Astragulus cannot be much affected without doing great injury to the foot, & therefore generally the whole foot is lost — The last Joints of the Toes are frequently Anchylosed. The great use of the Toes is to give a greater length of foot, & to make us stand firmer. The Toes bend outwards so as to be no impediment in Walking, and if the foot had not these its proper Joints its motion would be awkard — D. H.

# Bones of the Cranium.

The Cranium is a sort of Oval figure; because the nearer it approches a Sphere the more capatious it is; & also its roundness protects the brain the better. It is said to be small before that it might receive danger the better & flatned on the side to enlarge the Sphere of Vision. What effects this. It is supposed to arise from the brain growing Quaque versum; but we have reason to think this is ordered by other laws. The upper part of the Skull makes an Arch, and where there is any accidental depression it can scarce be raised to it former Equality, nor can a piece which is broken in be extracted, because the fracture of the fracture of the internal lamina will be larger than that of the external, otherwise it could not have gone in; as the bone carries off a shell with it internally, we must make the greater room by the Trepan. The size of the Cranium is proportioned to that of the brain. In human subjects it is said to be larger proportionally than in any other Animals; tho D.r Farren says there are fish of the Dolphin kind that have brains larger in proportion than even Men. The Skull & Brain are larger proportionally in infancy than in an adult state. The Cranium is nearly of the same thickness all over. Its texture is more compact on the outside & on the inside, but in the middle it is more Spongy; & this spongy or porous part is called Meditullium or Diploe, & all other Bones have this texture more or less. Authors say we should be cautious how we go on after passing the Meditullium, but this caution is unnecessary to the prudent Surgeon, for young Skulls are without Diploe, & in some parts of the Cranium it is always wanting. The Cranium is composed of Six proper & two common bones which are connected to each other by five Sutures.

A Suture is an articulation where two bones are mutually inserted into each other from distinct Ossifications. Where they Join they form serrated or zigzag processes which mutually receive each

other

Other are larger externally than internally; this constitutes a true Suture such an one as we find in the Temporal bone is called a Falsa Squamosa Suture. In Young subjects the Suture appear more plain, in old people they are sometimes obliterated, and also in some degree even in those of middle Age. Sutures are divided into proper and common, the proper belong to the Skull only, the common to both Skull & Face. Sutures are sometimes very irregular as the frontal & particularly the Lambdoid. Between the Sutures we sometimes observe the Ossa Triquetra or Wormiana, very distinct little bones & particular Ossifications, found mostly in the Lambdoid Suture the number of these bones are various & so is their size, they are nothing but new ossifications begun by nature to fill up the part the bones, & are most remarkable in watery heads where they may be seen at a great distance. Sutures serve to unite the Dura Mater to the Cranium more firmly and also to prevent extensive fractures. The Greeks suppose them to give vent to the redundant moisture of the brain & that ill consequences followed if those sutures were closed too soon, but as Ossification advances according to the Vis Vitæ, we have great reason to suppose the contrary. The Vulgar have an opinion that the bones of the head open in violent head aches, but this is really impossable.

The advantage of a number of Bones in the head, is that the Whole Ossification begining from several centers will be sooner compleat. At birth also the number of bones allows the head of the Infant to assume more naturally the shape of the parts, & the birth is thereby rendered safe & easy to both Mother & Child. Difficult Labour will be occasioned by Ossification being too far advanced which gives an unyealding hardness to the bones. Perhaps the pressure in Labour may give the head such a bad shape as may in some measure continue thro' life; if the riding of the bones be at the Vertex it is called horseshoe, if at the Fontinella it is called Molehot head. How

# Of the Cranium.

How shall we distinguish a Suture from a fracture? By being well acquainted with the Idea of a Suture & its appearance & figure. If the Periostium slides off easily it is in all probability a fracture, but if it adhears firmly a Suture: tho indeed a fracture & Suture may coincide. When a Suture is fairly divided it is to be treated as a fracture. May we Trepan on a Suture? Perhaps nearly as well as on any part, except where the bone is irregular, as in the Coronal Suture, & on the Middle of the occipital bone, where there is a Sulcus. In young Bones it will be difficult to extract the sawed piece of bone, because in them there is a greater connection between the Dura Mater & the Pericranium at the Sutures. In many cases it will be necessary to apply the Trepan on each side of the Suture: this was the case of a Nobleman whom Mr. Ramby trepaned, when he trepaned one side only the Symptoms returned, tho a very large opening was made, but upon Trepaning the other side they went off intirely.

For a particular discription of the Bones of the Cranium, and of the Bones of the face, their shape, Situation, Foramina, Processes &c. See Monro's Osteology.

# Of the Muscles of the Abdomen.

Authors disagree much about the Number of Muscles, they being more or less blended with on another, especially at their begining & Endings, & some divide them more minutely than others. In dividing the Muscles they should not be much split, tho for the sake of Regularity they are not to be too few; our best guide is their being actually distinct & detached. Where Muscles are very much blended the distinction of Action must assist us. The the number of Muscles vary often from the manner of dissection, yet they vary especially the small ones in different bodies, as the Pyramidales and Psoas parvus are often wanting.

The Names of Muscles, among the greeks particularly were sometimes numerical. Some have their original Names continued yet. Spigelius and many after him gave them Names from their Action, & these Names especially which were compounded of their origin & Insertion, as those in the Neck, Pharynx &c. this is a very proper method being a short discription of the Muscle. For the sake of perspicuity we continue some Names tho they are improper. Muscles are divided into Classes, as the Muscles of the head, Flexors & Extensors, Expiratory & Inspiratory &c. Rules concerning muscles: 1. If a muscle be fixed to a part that is immoveable & goes to a part that is moveable it must be reckoned a Muscle of the moveable part, as the Levator Ani. 2. If both Extremities be fixed into moveable parts we reckon it a muscle of the part that is most moveable, as the Brachiaeus 3. If a Muscle passes over several Joints & may move them we say it belongs to the last Joint, as the Flexors of the fingers; also Rectus Cruris is called a Muscle of the Leg. For we should make a distinction betwen the Muscles of & the Muscle on a part. The Method to shew Muscles 1. To follow Convenience. 2. to begin with parts that are apt to putrefy soonest, or that must be removed to shew the Viscera &c. Some take them in Classes, others as they arise in Dissecting which is the best Method.

Abdominal.

# Abdominal Muscles.

The Abdomen has five pairs of Muscles, which are of infinite consequence to the Machine, & have great influence in Respiration, Por the Viscera, & are connected in many principal diseases. On the Ribs externally they are fleshy, on the fore part of the abdomen Tendinous, some part looking more white than others. From the Xiphoid Cartilage to the Os Pubis a line of division runs down through the middle of the Navel and is called Linea Alba: as far down as the Navel it is broad & thence gradually decreases in breadth to the Os Pubis. This line is white being made up of the Tendons of all other Muscles, and because in the Parietes of the Abdomen there is no Muscle under it. — Lineæ Semilunares are lines where the fleshy part begins exactly at the Edge of the Recti Muscles. Lineæ Transversæ generally two or three on each side across from the Linea Alba to the Semilunaris, seldom coming much below the Navel; they are made up by the muscle which is first fleshy, then tendinous, the white lines are the Intersticies of Muscular flesh. ——

Obliquus Externus lies next the Skin, & has its fibres in an oblique direction: it covers the Hypocondria, inferior parts of the Thorax, and all the abdomen. The fibres run downward and forward, nearly parallel; the Muscular part lies backwards on the Chest, the tendinous forward on the abdomen. It arises from the seven or eight inferior ribs; the outside & lower Edge from the 12th. Rib is far back, on the 7 or 8th Rib more forwards. At its origin it makes digitations with the Latissimus Dorsi & Serratus Major Anticus which cover all the Ribs, Its insertion is more complicated. There is a little slip which is common to the great Pectoral Muscle & the External Oblique. The length of the fibres is different in different parts of the Muscle. The Posterior part of the Muscle is inserted into the posterior part of the Spine of the Ileum,

growing

growing more and more fleshy all the way. In going forwards the fibres form a Tendon & go down in the direction of the Groin to the Os Pubis. The fibres higher up run to the Linea Alba forming fascia over the Rectus Muscle, & these fascia at the top are insensibly lost. The length of the fibres is largest about the middle of the Muscle, becoming fleshy both above and below, in the fleshy & tendinous part. The tendon begins to be formed near the tendon of the anterior part of the Spine of the Ilium. Of its Use It may be considered to strengthen the Parietes of the abdomen, & support the Viscera. It may be considered as Straight, hollow, or mixed; as Straight it will bend the body towards the Os Pubis and bring it forwards, or it will bend the pelvis towards the trunk; as hollow it will compress the abdominal Viscera in Vomiting & in evacuating the faeces &c: as Mixed it will both compess the Viscera & move the bones: and being a Strong expiratory by pulling down the Ribs it will press the abdominal Viscera against the Diaphragm. This Muscle is of great use in emptying the hollow Viscera, that have out lets, as the Uterus, Vesica Urinaria, Rectum. Poparts Ligament is the tendinous or lower edge of the extuna oblique mixed with the ligamentous fibres of the other Muscles. It is united with the Fascia of the Thigh and the Cellular Membrane without a loose edge, the parts being firmly united so that the Intestine cannot come out without laceration: when it comes thro' at this ligament it is called a Femoral Rupture. The rings for the Spermatic Vessels to pass out at are at a little distance from the Symphysis of the Os Pubis, and the Spermatic Vessels come out through it in Men but in Women at the round ligament. These rings are no more than that the tendon divides into a thinner plain in the middle with a thicker on each side, & the thin fascia of the tendon are continued on over the Cord making as it were a Sheath, so that the Vessels lie behind the tendon. Both the thicker plains of fibres one above & the other below are inserted into the Os Pubis, so that in

Ruptures

# Abdominal Muscles.

Ruptures the Intestine must go down in the middle of the Sheath, and consequently get into the middle of the Cord.

Obliquus internus lies under the external oblique & is extended exactly over all the belly measured in extent by the Margin of the bone. The direction of its fibers is with that of the ribs Upwards & forwards. It arises all round the Spine of the Ilium & is there radiated: the posterior part is short going between the bones of the Pelvis & Thorax, the rest of the Tendon goes on to the Linea Alba & at last runing down in the direction of the Groin is inserted into the Os Pubis backward fleshy, forwards tendinous, & the Lineæ Semilunaris are made where the fleshy fibres end. The middle part has the largest fibres. The Rupture & the Spermatic Vessels pass down behind this Muscle being no perforation. The Use of this Muscle is much the same as the former which it assists in all respects. Some Anatomists have supposed these two Muscles to be one Digastric, but this cannot be because their Tendons are not united all the Way.

Transversus. Its situation is much the same as that of the former, only it is larger backward & tendinous forwards, & lies a little under the ribs on the inside, & over the Periotæum. It arises tendinous from the fascia of the Loins, from the inside of the Spine of the Ilium, & from the inside of the ribs near the margin of the Thorax, & runing thence always transverse comes forward & joins its Tendons to that of the oblique & goes to the Linea Alba & passes on to the Os pubis like the internal oblique, & the Spermatic Vessels pass under it in the same manner. Its Use. It goes round the body like a girdle passing across, & compresses the Viscera. It is an Expiratory pulling the ribs down, but has no effect in bending the body. The tendons of these three muscles unite, but some of the fibers go behind the Rectus & some before to the Linea Alba, for the tendons of the internal oblique split going both before & behind the Rectus, and all before below and those of the transverse go all behind making a Sheath for the Rectus to pass in.

Rectus

# Abdominal Muscles.

Rectus is narrower at the lower part and grow broader as it goes up. Its origin is narrower & tendinous from the Anterior part of the Os Pubis near the Symphisis. The Union of the two muscles make the Linea Alba. They are close together below but further a part above; as far up as the Navel it is fleshy above the navel it is tendinous in those places making the Linea Transverso. It passes over the Margin of the Thorax & is inserted into the Cartilage of the 5th 6th & 7th Rib & into part of the Ziphoid Cartilage. Its Use. It compresses the Anterior Viscera & is expiratory, & seems to be placed here as if Nature intended, that the whole parts should be fleshy equally compressing the Viscera. The Tendons of the extremities are firmly united to the transverse tendinous part of the Rectus by strong Intendenation that one part of the Muscle may act when the other is at rest, so that we can compress different parts either by pulling the Muscle that is above further down or Vice Versa.

Pyramidalis. They lie over the Symphisis of the Os Pubis close to the Linea Alba. They rise from the out side of the Os Pubis near the Symphisis, are broad at first but are gradually narrowed & run into the Linea Alba. They pull the Linea Alba to the Os Pubis, & serve to bring the Action of the Muscles nearer the lower part of the abdomen. They are often Wanting.

## Of the Hyoides & Cervical Muscles &c.

The Os Hyoides is situated in the Angle of the Neck over the Larynx, and is made up of five Cartilages. The Basis of the Os Hyoides is nearly convex forward, from whence the horns turn backwards & serve for the Attachment of Muscles. The horns are attached to the Thyroid Cartilage by Ligament. It has two Pennaform Processes placed between the basis & where the horns go back; they are generally cartilagenous except in old people. The Thyroid or Scutiform is made up of two sides with a Notch in the fore part, & the projecting part is called pomum Adami. The sides go backward & have an oblique ridge with a Hole just at the place. At the end are two processes, one of which goes up to Join the horns of the Os Hyoides, the other goes down to have a ligamentous attachment with the Cricoid Cartilage. The Os Hyoides embraces the Epiglottis.

Muscles of the lower Jaw. The Crotaphite or Temporal Muscle is covered by a tendinous fascia which being taken off shew it to be a radiated Muscle which covers portions of several bones of the head, rising from the bone that begins and the os sacr that it covers, the fibres collecting on the inside of the Zygoma & going down to the lower Jaw are inserted into the Coronoid Proces. It draws up the lower Jaw. Masseter is placed between the projecting Cheek bone and the Angle of the lower Jaw. It arises from the under edge of the Cheek bone & is inserted into the angle of the lower Jaw; and the more this bone is depressed the more this Muscle is upon the Stretch. The Temporal at its insertion lies under the Masseter. the Masseter arises nearly at the same place, but is inserted at different points, to compensate for which the fibres are tendinous where there was required the greatest length of fibres. It is a true pennaform Muscle from a tendon that runs over it. Muscle collecting its

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# Cervical Muscles.

Fibres, & as they arise lower down on the bone, they are inserted lower on the tendon. When the mouth is much opned & the Condyle brought forwards on the Eminance, the Crotaphite Muscle is much stretched & brings the Condyle into its place again by pulling the Coronoid process upwards & backwards. Blows on the head are of worse consequence than on any other part, as they do greater Injury to the Muscles which cannot yeald to them. Platisma Myoides is next shewn to arise from the thorax the fibres run over the Clavicle & collect on the Neck; the fore part is fixed at the Chin at the basis of the lower Jaw, the posterior part goes over the lower Jaw, over the Masseter Muscle & is inserted into the angle of the mouth, joining fibres with the Triangularis. It draws the skin of the breast & Neck up, & the lower Jaw down. Pterigoideus internus. Digastricus next. Then Pterigoideus externus, & lastly in this Lecture is shewn the Sterno Mastoideus which is the seat of the Wry Neck, & is to be cut through where contracted. Albinus calls it two Muscles. Its Use is various.

# Of the Testes & their Appendages.

The posterior part of the Abdomen has a projection in the middle caused by the Spine which divides it into a right & left Cavity with the Kidneys and Renal Capsule on each side. It goes down narrow to the groins bounded by the Psoas & Iliacus internus Muscles; these two Muscles make up the Ridges on the sides backwards: upon the Spine run under the Vena Cava and Aorta; The Spine makes the back part of the Azygos Cavity, & the Os Pubis the fore part, the Ossa Ilaca the lateral parts. The Ends of the Kidneys are as high up as the Loins.

Of the Testes. The Testes are placed in the Scrotum yet have their Vessels from the Loins contrary to Natures general Rule, which is owing to the Testicles being placed high up before Birth, and afterwards drawing the Vessels down with them into the Scrotum. The Spermatic Arteries commonly arise before the Emulgents, are very small and sometimes arise from the Aorta at some distance from each other. The right Vein arises on the right side from the Vena Cava; the left commonly from the Emulgent; but their Origin varies. The Arteries were supposed by Cowper & other to be small at their Origin, & from thence gradually increasing in Size; but Injections do not shew this. The Peritonium is a thin smooth membrane covering the parietes of the Abdomen, adhering to the Muscles ~~&~~ Cellular Membrane; it is reflected membrane covering the Viscera as well as the parietes, so that all the Viscera lie behind it. The Arteries & Veins of the Testes go down over the fleshy brim of the Pelvis behind the Peritonium. The Artery & Vein were said to Anastomose as in Eustach. & Albin. Figures, but they have no other Communication than that which is common to other Blood Vessels, for Arteries often send off branches which communicate with Veins. How do the Veins of the Testes pass out? They pass down behind the Peritonium & do not go through or perforate it. The Vessels take a rounded course in order that they might safely conducted, they being very small and tender, & are carried down in this Course by the Testicle as it descends.

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Within the Abdomen they are called Spermatic Vessels but without Spermatic Cord. Their Course is oblique in order to get to the Ring & pass under the edge of the oblique Muscles of the Abdomen. They are joyned as they go down by the Vas Deferens just at the inside of the brim of the Pelvis. The Cremaster Muscle arises on the inside of the Tendon of the external oblique or Poparts Ligament just below the Spine of the Os Ilium & joining the Spermatic Cord expands it self over it, going thro' the Ring of the external oblique Muscle. The Spermatic Cord as it goes down becomes more & more thick, & the fibres of the Cremaster Muscle are plainly seen going down over the Cord & expanding it self over the Testes; it serves to draw up the Testicles & is supposed to knead it, & at the same time to corrugate the Scrotum likewise. The Spermatic Cord is surrounded by Cellular Membrane first, then a tendinous Fascia from the external oblique and Lastly the fleshy covering of the Cremaster united with it: it has no loose Coat or Tunica Vaginalis Communis as Authors have discribed. There is an Artery, Vein, Nerves, Excretory Duets, Lymphatics in great Number, inclosed as before mentioned by Cellular Membrane, the tendinous Fascia & Cremaster Muscle. How does a Hernea pass down? When there is a Sack the Intestine &c. passes down pushing the Peritoneum before it, at first passes down with the Spermatic Cord before it [inclosed by the covering of the Cord & bearing up the Cellular Membrane] into the Scrotum. The Spermatic Artery in some Animals is remarkably convolated, as in Horses & Bulls, but in the Human Subject it has but small convolutions. The Spermatic Vein is pretty large & frequently Anastomoses with one another, go to the Scrotum & Testes & are apt to become varicose. The Tunica Vaginalis propria Testis goes up a little way upon the Cord & is not connected by Cellular Membrane: it is a Membrane of the reflected kind [by covering the body of the Testes &c] from the Back of the

Testicle

# Testes & their Appendages.

Testicle (where it is principally united to the Testicle) it is turned round again loosly over the Testes a little Way up the Cord. Therefore when the Coat is very much distended with water the Testicle will be felt behind. The Testicle is kept moist in the Tunica Vaginalis that it may by that means elude Pressure.

There are three sorts of Hydrocele: 1 The Anasarcous, in which Scarifications will relieve: 2. When the Water is in the Tunica Vaginalis propria Testis, Analogous to the dropsy of the Belly. The Cure of this second Species of Hydrocele is performed by discharging the Waters & raising an inflamation sufficient to unite this Membrane to the Testis. 3 Hydatids formed in the Cord preternaturally, as may happen to other parts of the body; irregular bags too are a consequence of the former. it happened so to a subject opned for demonstration. When the Hernia comes down in the Peritonium it has a bag or sack that is distinct from that of the Tun: Vag: prop: Testis which lies on the side the Vessels.

The Vessels run to the Posterior part of the Testis behind the Coat of the Testis. The Testis is uniform before, but on the outside of it the Epidydimus lies thick, large & firmly united by the body of the Testis, at the upper end less firmly & at the Middle & at the lower part it is tuberous again. The Testis is inclosed first by the Tunica Albuginea with the Vessels convolated, which are seen running into the body, & it incloses the Tubular Substance of the Testis; The Vessels run principally it across the Testis. The Tubular Substance was supposed to run in partitions or Louli from a Number of connecting plains like the partitions in a Lemon or Orange; But this Substance is only lobulated from the passage of Vessels. The Tubular Substance appears to be made up of tortuous Tubes, becoming more straight as they are pulled out; & that they are continued Tubes may be proved from Injections of Quick-Silver. These Tubes when spread, dried, & injected with Quick-Silver appear more plain. All these tubes are supposed to be continuations of Arteries, & that they are the

Secretory

Excretory Vessels that Strain the Semen. They go from the Body of the Testes to its upper part, & there become more large in the Epidydimus, there seems to be a great number of Lymphatics, for if you puncture the Coat of the Testes introduce a blow pipe, & break down the Vessels a little, you can blow up several Lymphatics. The Epidydimus is enlarged at the upper & goes down to the inferior part of the Testis, becomes tuberous again & then runs up & form the Vas Deferens. As the Vas Deferens comes near the Testicle it becomes convoluted & runs up to form the Epidydimus. It appears to be a Canal infinitly contorted, & may be unravelled to a Vast length. The Epidydimus appears to be but one until it comes near the upper part, then it divides into 8 or 10 Tubes which go on & unite with the Tubuli of the Testes: or we may say by tracing these Tubuli from the Testis they become united and at last form one Canal which goes out from the Epidydimus to form the Vas Deferens. The Epidydimus is Vascular and is no more than an Excretory Duct. The diseases to which the Testicles are most liable Schirrus Cancers, they are subject also to Inflamation and Suppuration. A Cancer begining from a blow first grows hard & larger, next is painful, & at last is truly Cancerous, these Complaints are rather in the Coats of the Testis, yet the Constitution is so much Vitiated that even Extirpation seldom Cures. The Tubular substance is generally affected. Swellings in Venerial cases are taken down by Spirituous Ven. Sect. Poultices, Rest & Thin a hardness remains it seldom becomes Cancerous but gradually subsides: this is chiefly in the Epidydimus. Vessels are Enlarged in all diseased parts, as in the Uterus.

Ruptures. The Peritonæum makes the Hernial Sack, which lies in the Cord, & is thence conducted to the Testes, at the Rings the Vessels lie behind, at the side or end we may feel the Testis in a distinct Membrane; how do they come in contact? The Testes in young Subjects thrust down a portion of the Peritonæum before it which makes a Bag for

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# Testes & their Appendages.

The Testes (becoming afterwards the Tunica Vaginalis), & if the Intestine happens to come down at this time it makes the Congenial Rupture, & prevents the Peritoneum from uniting to the Cord & therefore prevents there being any Tunica Vaginalis Propria Testis. In the common Inguinal Rupture the Epiploon at first goes down with the Vessels in proportion to the Quantity that is pushed down the Aperture is larger & smaller. The Passage of the Rupture is Oblique like that of the Vessels, but this obliquity decreases as the Aperture is larger. This obliquity seems to be the more as the Herneal Sack has not a precise begining, the tendinous Expantion of the Muscle being drawn over the Sack: The tightness of the sack is occasioned by a close band of the tendinous fibres of the oblique at the beginning of it entrance. In the Congenial Rupture the Testicle is found in the same Cavity as the Rupture, the Rupture being in the Tunica Vaginalis. The Hydrocele is distinguished from a Rupture, because in the latter case the Tumor is continued down from the Belly, in the former it goes a little way only up the Cord: but sometimes the Water will run up the Spermatic Cord in the same Manner as the Tumor works down, it sometimes will get into the Cavity of the Abdomen, at other times it reaches only so far as the Abdominal Ring; this is sometimes with & sometimes without any Inflamation or Fever.

# Male Organs of Generation.

The Scrotum is the external covering of the Testicles. Its middle line or Raphe extends from the lower part of it to the end of the Penis; it is sometimes a sulcus & sometimes it is rather a ridge. How is the Scrotum corrugated? Is there a thin Muscular Expantion under the Cutis called Dartos? It is not yet determined whether it be done by the Cremaster Muscle, or some Muscular fibres which lie under the Skin & are not Visible. There is certainly no Appearance of a Muscle from the Fasciculi or the Color, but one may exist as probably they do in the Iris without being seen. The Scrotum is more corrugated in young than in old people; Venereal Inclinations and Cold have the same effect. The Scrotum at the lowest part is chiefly composed of the reticular Membrane, there is scarce any Adipos. The Septum Scroti was said to be discovered by Ruysch going from the Raphe to the Middle of the Penis: The Vessels go on this partition, & it is a part that is not capable of being stretched as the rest of the Cellular Membrane. It is said by some that Air & Water pass from one side to the other, & that there is no ligamentous Membrane to be observed that is right but the D^r says that the Cellular Membrane at that part is more ligamentous, & that Vessels pass on it. In an Emphysematous Case of an Aperacary that D^r Hunter opned. he divided the Scrotum on one side and dissected the Cellular Membrane close to the Septum, which then fully contained the Air. The Use of the Septum is said to be to divide the Testes that they may not twist; but it is more probable that they act as a Suspensary Ligament.

The Penis is a compounded Organ being the Excretory Pipe for both Urine & Semen: its Size, Figure, & Situation need no description. A part of it is conceald that lies under the Scrotum. It arises partly from the Symphisis of the Os Pubis & partly from the Os Ischium; it fills up the Cavity under the Os Ischium & then becomes external. It is composed of two Corpora Cavernosa making the largest part, & one Corpus Spongiosum Urethræ, & this Organ part makes the Glans Penis, & through this also runs the Urethra.

On

# Male Organs of Generation.

On the upper part the Corpora Cavernosa lie close together & give breadth, below the Corpus Spongiosum lies between the two former as in a Sulcus. At the root the two Corp. Cavern. arise from the Os Ischium, from whence (being at this place distinct making the two Crura Penis) they run up & join. The Corp. Spong. at its root terminates between the two roots of the Penis, making the Bulb of the Urethra which turns into the Peritonæum. The Corp. Cavern. when dissected & blown up appears to terminate at two points at both ends, close above and divided below, with a Sulcus both above & below, but deeper below for the Corp. Spong. in the Sulcus above is the Vena Magna. They are strong ligamentory Pipes laid together & filled with a Spongy substance, but tho distinct at their beginings as they go up they communicate & become as it were one Tube; they are filled with a Cellular Substance freely communicating with each other. The Sulcus is occasioned by the Septum Penis which is complete almost at both ends, but in the Middle is as it were Perforated. In the Cellular Substance near its Axis runs in each Corp. Cavern. an Artery to fill them with blood, which occasions the Erection by being there deposited & not returning by the Veins. The Partition makes these bodies flat. The Vein is common to the three bodies. Near the end of the Penis ligamentous Cords run in several Directions thro' the Corp. Cavern. The Corpus Spongiosum Urethræ is small above the Middle & lies above the Sulcus on the under side; it is inclosed in a thiner coat than the other two bodies, but has the same Cellular Substance which surrounds the Urethra that comes through it from the bladder, but there is more Spongy Substance below than above. The Glans Penis is no more than an Enlargment of the Corp. Spong. and is hollowed so as to receive the Corp. Cavern. The great bulk of what appears to be spongy substance is a Plexus of small Veins, how far this is continued is very uncertain

At

At the root the Corp. Spong. becomes thicker & is called the Bulb of the Urethra. Its begining is undetermined, it gradually becomes less as it goes upon the Penis. The Urethra does not come into the Bulb at its end, but it goes into the side of it there being a loose part that is Pendulous and without the Urethra. The Penis is inclosed in a Cellular Membrane which becomes more Ligamentous as it comes nearer the Coats. The Lig=amentum Suspensorium that arises from the fore part of the Symph=ysis Pubis is said by some to give a Ligamentous covering to the Penis indeed we cannot trace it where it ends, for the Ligamentous fibres ex=pand themselves over the Penis. The Penis has a pair of Arteries external a pair of Nerves & one Vein, they lie close to the Corp. Cavern. giving branches to the external & internal parts. In the Middle runs one Vein, & the Artery is accompanied by the Nerves. The Vein is most easily filled from the Corp. Spong. tho it is the principal Vein of the whole. Veins grow very numerous towards the root of the Penis. On the outside of the Penis is the Cellular Membrane & Integuments, hence it does not increas in fat people; when the Penis is inflated the whole appears meerly cel=ular, & this loose Cellular Membrane is the reason that the skin of the Penis is so moveable. The Preputium is the Skin, Retemucosum, and Cuticule Continued down over the Glands, but not so moveable on the Glands. In the Neck it is loose, on the Penis itself very loose, so as to double like a Cap over the Glands. The aperture is larger in some than in others, where it slips more easily over it. At the Inferior part of the Glans at the Neck the Integuments are tight & fixed close to the Glans making the Frenum. The inside of the preputium is a doubling of the Integuments only internally which are thin, red, & tender & they are peculiar in this that they are very thin & Vascular. The Villi which are long on the Glans & enter the Preputium are very Vascular;

These Villi appear when the Cuticle is taken off. Glans loosly. Children are generally born with a Prapitium, but the aperture is small; in grown people it is so large as to keep behind the Glans. The Operation for the Phymosis is making the aperture so wide that the Skin may be pulled back over the Glans. Phymosis drawn back occasions the Paraphymosis, which girds the Sulcus of the Glans so as to make it Necessary to make a longitudinal Incision of the skin to set the parts at Liberty: The Operation does the same thing in both: by cutting the Frenum you set the skin loose at that part. The skin of the Glans is naturally soft & moist within from the Odoriferous Glands & Exhalant Vessels. These Glands appear like pins heads, & tho these small Orifices ouzes a Cheese like matter that often produces inflamation; Cleanliness here is certainly extreamly wholesome & prevents many diseases.

The Muscles of the Anus. The Sphincter Ani arises behind from the Skin of the posterior Perinaum, & when it comes to the Anus it divides & goes round the Rectum & there unites again. The Principal part of the fibres runs forwards to bind with the Accelerators urinæ. The side of the Gut is covered by the Levator Ani, & serves to draw up that part of the gut not supported by bone. The Erector Muscle of the Penis lies upon the Crus Penis & is lost upon the bulb of the Urethra; this Muscle draws the Penis downwards & backwards. Also Compresses the Crus. The Accelerator Urinæ covers the bulb of the Urethra, arises from the Sheath of the Corp. Cavern. near the bulb;

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The two Muscles going down meet the Sphincter Ani serving to give attachment to each other. Its action will be to compress the Urethra, & from its connection to the Sphincter it will act with & correct with it. The transversales Perinæi are muscular fibres arising from the tuberosity of the Ischium, running across are lost at the point where the Muscles are blended; they help to make a sling to support the parts. The filling of the Penis or Erection is caused from other reasons than from the Erector Muscles, for they act when the Sphincter Ani acts. The immediate cause of filling the Penis is from the accumulation of the blood in the parts, which is perhaps occasioned by something nervous that stimulates. Albinus thinks it cannot be accounted for mechanically. Perhaps these Muscles help to squeese in some blood from the Roots, & through the Veins into Lugo, & when they act on the Semen they narrow the Canal, & throw the semen out more forcibly, drive blood for that time into the Penis, & cause a more firm temporary Erection &c

# Contents of the Male Pelvis.

Writers on the Operations of Lythotomy have very inaccurately treated of these parts, being probably confused from not considering the situation of the parts. In order to have a true notion of these parts, we must consider the line or Axis of the body of the Pelvis, for these two lines intersect each other almost at right angles: we propose to refer chiefly to the line of the Pelvis, as by that means we can have a clear Idea of them. The Os Pubis makes the Edge of the Pelvis before, the Os Sacrum behind. The joint of the Os coccigis is nearly in the middle of the lower Pelvis. The Pelvis is bony from behind one half Way; from the Os coccigis to the Pubis the circle is completed by the Sling like Muscles. The Levator Ani arises from the Inside of the Os Pubis, & from the Fascia that covers the Obturator Muscle further back; the forepart blends its fibres with the Sphincter Ani. Above this Muscle is the Transversalis, below it the Coccygaeus which arises from Os Ischium & is inserted into the Os Coccigis, it is blended with the Levator. These Muscles where they meet make the middle line of the Pelvis, and these three Muscles are blended together so as to make a fleshy support for that part of the Pelvis that is without bone. All parts without this support are external, all parts within it internal. This Sling has longer fibres in the middle, & shorter on each side. This Muscle is perforated by three holes in females, the Anus, Vagina, & Meatus Urinarius. The external parts are the Penis & Scrotum. In the Perinaeum there is Skin & Cellular Membrane, then the bulb of the Urethra, which does not go quite to the Anus. In this Space is the common Mixture of the Muscles. At this part the Urethra gets into the bulb on the inside, not at the End. The Urethra & Anus internally soon get close to each other. Cowpers Glands lie Just within the bulb in the angle between the Bulb & where the Urethra comes out.

The

# Contents of the Male Pelvis.

The internal parts are the Rectum, Bladder, Prostate Glands and Vesiculæ Seminalis, which are properly considered as the Contents of the Pelvis. The Rectum after making several turns on the bones terminates in the Anus: it is supported by the Os Sacrum & Os Coccygis, & the Sling muscles. The Name Rectum being improper it being straight in no View, but takes the turn of the Pelvis. The Bladder is of an oblong figure, placed in the fore part of the Pelvis behind the Symphysis of the Pubis, it runs downwards & backwards in the Pelvis towards the Os Coccygis. The Vesiculæ Seminalis & Prostate Glands are placed between it & the Rectum forwards, behind they are in contact with Rectum. The Bladder is fixed at the Prostate Glands & behind that it is loose on all hands. When the Rectum & Bladder are full they take the round & occupy the principal part of the Pelvis, & thrust up the Intestines: the Bladder will sometimes rise behind the brim of the Pelvis. The Prostate Gland is oblong having a Basis & Point: it is an internal part placed in the fore part of Bladder between it and the Rectum. The point with respect to the Pelvis is upwards & forwards, the Basis is backwards and downwards. The Urethra comes into the upp side of the Prostate Gland from the Bladder & runs thro at the point. The Vesiculæ Seminales run back on the Bladder from the Basis of the Prostate Gland, which may be felt in the living body. With regard to the whole body the Urethra is situate in the most depending part, & the Perinæum is the lowermost part of all. The Peritonæum covers the upper fore part of the Rectum & Bladder with respect to the Pelvis, being reflected from Muscles to the fundus of the Bladder & lines the sides. The Ureter comes down from the Kidney, and runs down to the Bladder on the side of the Pubis on the outside of the Peritonæum. Vas Deferens comes from the Vesiculæ Seminalis below & behind that part of the Bladder where the Ureters enter it, so that the Vas Deferens goes on

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## Contents of the Male Pelvis.

the inside of the Ureter & denudates it, & both may be seen thro' the Peritonaeum, & the Vas Deferens geting to the Ring of the Abdominal Muscles goes down with the Spermatic Cord.

# Lithotomy.

There are two kinds of Operations for the Stone the high & low. Franco was the first inventor of the high operation from this Accident, that feeling in the Bladder above the Os Pubis, he cut on it and extracted it, he did not propose to follow this method, but Douglas & Cheselden improved it into a regular operation. To prevent wounding the Peritonaeum they destended the Bladder so as to throw its fundus & of course its Peritoneal covering so far above the Os Pubis as that they may open the Bladder without wounding the Peritonaeum, for should this happen, the Bowels would gush through and the Urine get into the Cavity of the Abdomen & the Patient die.

The Low operation. In Marianus's Method they cut near the Perinaeum, & only thro' the bulb of the Urethra. The lateral operation was invented to get into the side of the Bladder. Frere Jacques cut without a staff, and at first did much mischief. Mery & Cheselden added to this operation the use of the staff Frere used it too. In the operation they now cut thro' the Accelerators Muscles, the bulb of the Urethra, the fore part of the Levator Ani, Sphincter Ani, & the Canal of the Urethra, & sometimes the side of the Prostate Gland; so that Operators do not cut into the side of the Bladder as they have imagined. In the old way they could not cut further down than the bulb of the Urethra. The Difficulty of passing a staff into the Bladder is to keep the point of the Instrument upwards & all the

Cabinet

Caput Galinaginis it Generally stops in the orifices: We should use no force & draw the Instrument a little back, the finger may be Introduced into the Anus & geting it on the inside of the Perinæum you may make the Canal streight. In the old Way of cutting the Staff was made to press against the bulb & membranous part of the Urethra which were cut, & the other parts were stretched & cut open Cheselden proposed in the lateral operation to cut the Bladder & not the Urethra, but what we now cut must be the Urethra into the Bladder, the Prostate & Levator Ani. If we cut far back we wound the Rectum & Vesiculæ Seminalis. But by making an Incision into the Groove of the staff at the Bulb & Membranous part of the Urethra, we now perform the operation with great safety by Means of the cutting Gorget making a lateral Wound into the Bladder thro' the Prostate Gland. Cheseldens Method of cutting behind the Prostate was not practicable from the danger of Wounding the Vesiculæ Seminales & Rectum.

Of the Diaphragm.

It is the great Antagonist to the abdominal Muscles, it kneads the abdominal Viscera & carries on respiration. Figure. It is concave below & convex above forward it is uniform, behind it is divided by the Projection of the Spine, making the left & right Cavity. It is fixed all round the Trunk, & is a radiated muscle. The posterior part is called the little Diaphragm, & runs from two Tendons; the great or right Crus is fixed to the second lumbar Vertebra; the small or left Crus arises from the first & second Vertebra. The right Crus is larger having more room to become so, & grows fleshy, & uniting with the other permits the Aorta & Thoracic Duct to pass through it making a Notch. What lies on the Spine is called the little Muscle.

These

# Of the Diaphragm.

These Crura become broader & broader rising from the first Vertebra Lumborum, & then from the Tranverse Process, & so on from the Ribs & Cartilage Ensiformis. The fibres go all to=wards the Center & terminate in the Centrum Nervosum or Tendinosum, which is something like the heart in Cards with the apex rounded off. The Tendinous parts splitting into two. This Partition between the Thorax & Abdomen allows an Artery to go down, & the Thoracic Duct to come up, as has been already said. The Passage for the Oesophagus is an oval Figure in the fleshy part almost in the middle of the Body, which as it is Muscular seems to act as a Sphincter. The Figure in the Tendinous part is for the Vena Cava to come to the Heart, & is round. The Diaphragm is a Muscle of inspiration in a double sense, as the Abdominal ones are Expiratory in a Double Sense. The Diaphragm pushes the Viscera of the Abdomen downwards, by bringing itself into a plain, and is counteracted by the Abdominal Muscles, but this the Diaphragm does not uniformly. The Abdom=inal Muscles also serve to pull down the Ribs, and the Diaphragm antagonises these Muscles by raising the Ribs

# Male Organs of Generation.

Of the Muscular parts. The Levator Ani & Coccygei have the same Origin & Course, only they are differently inserted: they were considered as one Muscle before Douglas & Eustachius. The Bladder is connected with the Organs of Generation: the Under part of the Bladder & Prostate Gland are supported by the Rectum. The flat under side of the Prostate that lies on the Gut has a Notch like a heart at its basis, the Upper side is connected to the Bladder. The Vesiculæ Seminales go back behind the Prostate. The Vas deferentia come to the Notch at the Prostate they are two in number, they arise from the Testes, and come nearer each other as the approach the Prostate. Each has distinct Vesiculæ Seminales. Of the Bladder: first its shape. It is in Brutes Pyriform & may be divided properly into body & Neck. in Man it is oblong with the Urethra, with respect to the body in the most depending part. The fundus does not properly belong to the human body, neither being a depending nor the most enlarged part, but is further from the Urethra. The Cervix is not in the human body different parts have been misunderstood by the Term. In the Fœtus the Bladder is more the shape of Brutes. ——

Structure. The upper part of the Bladder on which parts are moveable has a Peritoneal Coat. In Brutes it has a whole covering from the Peritonæum. It has two proper Coats. The first is Muscular & has a power of Expelling the Urine. The Bladder is more firmly connected at the Prostate Gland, where the Muscular fibres are Longitudinal & from hence they go into the fundus of the Bladder, they seem to run in a longitudinal direction on the fore & back part from the sides & appear there more strong & distinct. From the Top of the Bladder is extended a ligament called Urachus, supposed to carry the water to the Alantois, and the fibres are continued a little way on this; but the Alantois has the appearance of a Tube, it does not perform that office. &

# Male Organs of Generation.

It is probable that the fibres run all round the Bladder going out from one end & coming in at t'other. Douglas was for dividing it into the longitudinal or Detrusor Urinæ & the transversalis, and then the circular making the Sphincter. Within the longitudenal fibres are the transverse or circular fibres making an irregular Net-Work; betweeen the Muscular & internal coat there has been discribed a Nervous, which is no more than a Cellular Coat or membrane that connects the two other Coats together; the internal Coat is one of the thinest membranes in the Body and thro' it may be seen the Fasciculi of muscular fibres yet it is very dense; this internal coat has been called villous, but D^r. H. never did observe this appearance. Its perforations are three, for it receives Urine by two Ureters, & Expels it by the Urethra; these make an Equilateral triangle. The Ureters pass in slanting, which kind of passage serves as a sort of Valve, and when pressed by the Urine one side is pressed against the other. The passage is of some length from where it enters to the part at which it opens, so that when the Bladder is Stretched the internal coat collapses on its orrifice. The Ligamentous Substance of the Ureters goes on to meet with that of the other Ureter, and then it goes down to the Basis of the prostate to prevent this part from being too much Stretched. The Bladder is a reservoir of Urine, which is prevented from getting out by the internal dense membrane. It has Muscular fibres to give strength and assist it in expeling it; sometimes in diseased Bladders the urine will get in & distend the Ureters.

By

By a knowledge of Hydrostatics we may understand how the Water gets into the Ureters when distended, it is owing to the smallness of the tube, for such a length of Column with such a small orifice will be vastly superior to the resistance. Protrusions or Saccule of the Bladder happen from the internal membrane protruding between the Fasciculi of fibres from hard straining; Nature seems to guard against this by different directions of the fibres. This was remarkable in Gardner's Case where in the inferior part of the Bladder there were six Saccule. Every Stone in the Bladder is apt to produce a Saccules, sometimes of the internal Coat only, sometimes of both. Stones makes beds for themselves sometimes, and so cannot be felt, & they are sometimes cloathed with a soft substance. The Bladder is very Vascular, but the internal Coat not so much as the external, and probably not so Nervous as the Intestines. It is apt to grow Callous & to have fungous Excrescenses. In a Case the D. opined, the Body was filled with this fleshy substance.

Vas Deferens as it goes up from the Testicle is a little tortuous, then becomes streight, & as it comes near the Vesicule Seminalis it grows larger Cellular & tortous. One Pipe goes on to the Urethra thro' the Prostate Gland, & it communicates by another with the Vesicule Seminalis. The Vesicule Seminalis are not a Cluster of Cells, but they are formed as it were from a Duct that branches out. The Internal surface is simular to that of the Gall-Bladder, Honey Comb. The Prostate Gland is follicular & Vascular, on squeezing it a great quantity of liquor comes out like the discharge of a Clap. 'Tis but one Gland in the Human Body but two in Brutes

Cetaceæ.

# Male Organs of Generation

Caput Gallinaginis is so called from the resemblance this part is supposed to have to the head of a Woodcock. Between its two orifices is a Lacuna or blind bag: The Use of it is not known. At the two orifices the seed is discharged from the Vesiculæ Seminalis.

The Urethra is a Membranous Canal continued thro' the Prostate & Corpus Spongiosum. It is very Vascular & tender the whole ways=
=pecially near the Glands; There are Lacuna with their orifices in the Current of Urine: near the Gland is one very large. Thes Lacuna are said to be orifices from Cowpers Glands, but the place where they open is rather uncertain. The Use of the Prostate is not well known: some thinks it yealds a lubricating juice, others again something seminal, others to assist puthing the seed forwards. The Lacuna yeald a juice properly for lubrication.

The Semen is secreted in the Testicle & is conveyed from thence by the Vas Deferentia to the Vesiculæ Seminalis: the thinner part is absorbed in the passage. The Semen is prevented geting into the Urethra by a Structure, but may be forced out when turged by the Coats of the Vesiculæ Seminalis. When full the semen may be ab=
=sorbed & resumed into the Blood. The secretion of the Semen happens at a particular time of life when the Constitution becomes greatly altered. This probably is occasioned by the reassumption of the Semen into the Blood. Its Sensible Qualities. It is said at present not to be distinguished by the Animal eye but by a particular smell. Itseldom comes off in Gleets Gonorrhoas. In a common Clap there is no visible ulceration only an Inflamation of the internal surface, which seems to be proved from the discharge being from the Prepuce & Glands only.

which

Which is no more than Cuzing. Sometimes there are internal as well as external Sores. D.r H. imagines Quicksilver destroys the Venereal poison in the same manner as Sulpher does the Itch; but it is rather doubtful and should be applied with care in Chancres, as it may heal up the part & soon appear in a nother. Stricture is more probably owing to Contraction than Excrescence. tho' Daran is of a contrary opinion. Bretching is a method of cure preferable to Dizection; but the Candles should be used with discretion least you make another passage, & get on the out side of the Canal

# Female Organs of Generation.

The Situation & Knowledge of these parts is very necessary & should be well understood. The Bones will be our best guide to a true Knowledge of their situation. Of the External parts. The Mons Veneris is where the Skin is cushined up with fat over the Os Pubis, & covered with Hair; this is not circumscribed but runs upon the Hypogastric Region. From the Mons veneris downwards we have the Labia Externa made from the fissure of the Mons Veneris. The uper part of the Labia about one half lies on the Symphisis of the Os Pubis. As they gradually grow larger so they are insensibly lost in the Perinæum. The passage into the Vagina (especially in Women who have had children) is not in the most projecting part, but far back between the posterior Extremities of the Labia; behind is the Perinæum, then the Anus & then the Posterior Perinæum. The Labia are naturally in contact with the Skin. In this part they are dark coloured, internally where they come in contact with the Labia are red. The Labia externa being opned at the upper part, there appears a middle projection before the Symphisis Pubis called Clitoris. Below the Clitoris are the Nymphæ or Labia Interna, with the passage into the Vagina. Below them at their inferior part is the Fouchet or doubling of the Skin, continued from one side to the other behind the Vagina making the begining of the Perinæum. The Nymphæ with the greeks are what we now call Clitoris. The Nymphæ are continuations of the Labia Externa below, and sometimes of the Clitoris. It appears beyond the Labia externa discoloured, being a doubling of the skin: above it is a continuation of the Præputium Clitoris, & below from the Glans Clitoris which makes a sort of Frænum. The Nymphæ seem to be lost about halfway from the begining down the Fouchet.

From the Symphisis Pubis to the Perinaum is the passage of the Vagina and immediately under the symphisis is the Meatus Urinarius. The Infundibulum or Ostia Vaginæ is all smooth, but when the Vagina begins it is rough, at this part lie the Caruncule Myrtiformes or Hymen at the begining of the Vagina or at its upper part. In a Maid the Vagina is more streight but in those who have had Children there is some sort of bearing down, being the Urethra or upper part of the Vagina. To come at the Urethra to introduce the Catheter, you first put a Cloth under the Woman, let one leg (viz the left) be lifted up a little, then with your left hand you feel above the Leg for the Symphisis Pubis, & just under it you will find the Meatus. Then with your right hand you introduce the Catheter under the leg which is drawn up, and the forefinger of your left hand will be a guide for the Instrument. Where the Granulation begins at the fore part just above the joint is the Urethra. The Reason of the oblique passage of the Uterus. It follows the sweep of the Gut turning inwards with the Anterior Perinaum, as the Gut does with the Posterior Perinaum. These parts have a Tendency to fall down, but by means of this oblique direction they have a support on the Perinaum &c. When the Perinaum is tore in Births the Uterus can scarce be supported with Pessaries. In Birth the Child pushes against the Vagina, Perinaum & Gut, because on the fore part there is bone which cannot give way. In the first Labour we should take particular care that the Perinaum be not ruptured, & instead of endeavouring to force the pains, it would be better to support the parts that the pain may not have its full force. The Perinaum is as it were a Valve to the Vagina, & supports the contents of the Pelvis. The Clitoris is analogous to the Penis in Men; it has two Crura like it two Corpora Cavernosa situated under the Pubis

The

# Female Organs of Generation.

The two Cura make the body of the Clitoris. The Sphincter Ani, Levatores, Coccygis, & Transversales have the same Cura as in the Male. There is another Muscle called the Sphincter Vagina going all round the Infundibulum coming from the Perinæum & terminating in itself, it compresses the Plexus Retiformis and draws up the part. If by accident the Perinæum be ruptured into the Gut a woman cannot afterwards retain her Fæces, because the Muscle is tore thro', and of course its action must be lost for the future, or by contracting must open the gut more. The principal use of the external parts are for irritation. These parts have glands sometimes visible called odoriferæ. & for the sake of greater sensation the internal parts are very vascular & villous; The use of the Clitoris is to give irritation like other external parts. It is also not detached but the end is as it were doubled upon itself, the glans being downwards. The Plexus Retiformis is an appendix of the Clitoris. It is capable of Erection from its texture, & being filled with Blood in Actu Coitus is pressed only by the Penis & must therefore be capable of great irritation. The Hymen is certainly met with in the Stricture or narrow parts of the Vagina. In the Fœtus it has the appearance of a fold projecting forwards, but this when stretched looks like a Crescent the broad part being next the Peritonæum.

Of the Intestinal Parts. The Situation of the internal parts are like those of the Male. The upper part of the Bladder is covered with the Peritonæum.

The

# Female Organs of Generation.

The Uterus lies low in the Bottom of the Pelvis but is loose that it may be raised as high as the brim of the Pelvis. It is covered by the Peritonæum reflected by the Bladder: it is loose forwards & backwards, but the sides are connected to the Pelvis by the broad Ligaments made by the Peritonæum fixed to the sides of the Pelvis; thro' this doubling of the Peritonæum the Vessels pass on the Uterus. The round Ligament goes down to the Groin, & the Fallopian Tubes pass out from the Uterus near the Angle, and terminate in loose Fimbriæ, at a little distance from which are the Ovaria tied to the Womb by a ligament. The Uterus lies between the Rectum & Bladder, & from the Weight, dependance and pressure of the parts above, they naturally lie loose. The Situation of both Rectum & Bladder is much the same as in the Male. The Ureters also come into the Bladder as in the Male. The Urethra is short and the Bladder lies on the Vagina, as it does in the Male on the prostate Gland & Rectum. The Vagina is connected forwards to the Bladder & Urethra & backwards to the Rectum. The Bladder & Uterus are not so much attached as the Uterus & Rectum are; & a part of the Bladder is supported on the body of the Uterus. The perforations, as Rectum, Vagina, & even Urethra, are surrounded by their proper Sphincters. The Broad ligament is made up of two lamellæ of the Peritonæum by reflection from one Viscus to another, between which the Vessels come to & pass out from the Uterus. The Urethra in females is very short. In disorders of these parts, from their close connection great sympathy must be produced, hence we account for the Symptoms, & for the Use of Clysters &c. Any thing that causes great pressure, as fungus of Uterus, will cause Labour pains; also indurated faces will produce these Symptoms.

The

# Female Organs of Generation.

The Situation of a Tumor may be determined by examining the Rectum, as it will be felt either before or behind the guts: also by examining the Vagina itself. Where the Tumor is very large it will possess a considerable Space of the Pelvis. Dr. H. once saw a case wherein it occupied almost all the Cavity of the Pelvis. We may easely conceive what happens in a bearing down. The Mouth of the Uterus passing down carries the Vagina with it: if the Tumor be of any length the Vagina is in this Case inverted. There are two kinds of this disease; one when the Mouth of the Uterus presses down as has been discribed; the other is when the Vagina itself prolapses, this disease may easely be distinguished by the rugous appearance of the Vagina & the smoothness of the Mouth of the Uterus. When the bearing down is considerable, the direction of the Urethra will be downwards & backwards: from the Bladder being drawn down on account of its connection with the parts, which will cause a difficulty of making water. In Tumors of this kind we may distinguish whether they are of the Uterus or Vagina. In the prolapsus the Uterus is not inverted nor the Bladder, but the Rectum is; tho' a late Writer Haun has given an instance where from Violent Straining to make water the Bladder was absolutely inverted. From the Nymphæ inwards is the Infundibulum. The Vagina begins at the tight part where the Hymen was originally. The Vagina is very red & rugous, most so at the projecting part made by the Urethra, which is perhaps also the most sensible. The transverse Ruge decrease gradually to the Bottom of the Vagina & towards the Os Tincæ the skin becomes very smooth & is continued into the Uterus. The Uterus at the end of the Mouth contracts nearly to it natural Size.

## Female Organs of Generation.

The Shape of the Uterus. The Bottom is rather rounded but flatned before and behind. The thick lower part is called the body, where it becomes small it is called the Neck, and at the Os Tinca it becomes again a little enlarged. The shape of the womb internally is Triangular, something resembling that of its external appearance. The substance of the Womb at the Neck and upwards is white & hard, and rather destitute of blood Vessels. The Womb is thinnest at the Angles where the Fallopian Tubes go off than at the Neck or Fundus. The fundus is covered with a fine smooth Membrane, but at the Neck the surface is rugous, there being as it were one middle line with strata going out from thence on each side something like a feather. The Corpora Globosa lie also at this part like Hydatids. The Uterus externally is more vascular and like muscular flesh, and internally it becomes less Vascular, & as it were white & callous, & this decreases from the Neck to the fundus. The Os Tinca is a little open, but at the neck it is very close. In those who have the Catamenia on them Blood may be plainly seen oozing out of the orifices. Tis difficult to say whether the Uterus is muscular or not. There are no distinct layers of fibres. D. H says no doubt but that the Vagina & Uterus have muscular fibres perhaps mixed with ligamentous, as we may judge from a Peristaltic motion to be seen in Brutes that are in pain, & the contraction in the human Subject at Birth. On the upper edge of the broad double ligament the Ovarium is placed on the posterior part by its ligament & the Fallopian Tube before. The Ovarium is externally rugous, one end connected to the Uterus laterally & behind the Fallopian

Tube

# Female Organs of Generation.

Tube, the other end is near that of the Fallopian Tube. connected to it by a continuation of fimbræ. The Fallopian Tube runson from the Uterus before the Ovary & is strung on the Peritoneum as on a Mesentery with the Vessels running to it. The orifice is open at the jagged extremity & gradually decreases to the Womb & makes convolutions like the Intestines. It has floating Fimbræ all round the orifice and going from it down to the Ovarium. Where the Tube opens into the Uterus it hardly admits more than a Bristle. An Ovarium cut thro' appears to be a Vascular fleshy substance with=out any thing particular in its texture. In Cows & Ewes it seems to be made up of little Hydatids, the lymph when boild look like the white of an Egg; there is nothing like this in the Human Subject, unless in one with child or those that have had Children, there is an appearance within the Ovary which the D. calls Calix Ovi, it likewise goes under the name of Corpus Luteum, (June 19th 1761 D. Morro & D. S. upon dissecting a Bitch they had killed before the delivery was perfected; found on cutting the Ovaria Horizontally, the Corpor Lutea very distinct, Vas many as there were puppies two on each side evidently hollow seeming to have been Nidures for the Ovi according to Degree & Wm. Hunter. The Uterus of a Bitch is divided into a body & two Cornua.


A represents the Vagina B the Corpus Uteri C.C. in each of which were the Puppies.

In blowing thro' the Urachus they inflated very fruitfully the Alantois between the Chorion & Amnios. The Mouth of the Fallopian Tube was situated right & directly opposite the Ovarium, more so than in Human Subjects which is a particular body that is circumscribed and different from the surrounding parts, as if the Egg had dropt from itself.

# Female Organs of Generation.

Old Physiologists call this the female Testicle & suppose it to seperate the Semen, but since DeGraa & Vn Horn suppose it to be the seat of the Egg. To convey something to the Uterus is the Use of the Tubo Fallopiana: & Galen called them the Vasa Deferentia. There is a great Analogy betwixt Viviperous & Oviparous Animals, & from Mr. Hunters Expert it appears that something perhaps not more than a fluid is taken up from the Ovaria by the Fallopian Tubes & conveyd to the Womb. D. K. allways observed the Corpus Luteum in those who have had Children, & in two Women which he opened who had twins he found two of these bodies appeard which last for a certain time. The Fallopian Tube internally has fine slender floating longitudinal Folds. The round ligaments seem to be a Vascular Plexus of Vessels going to the Groin. The Vessels are Spermatic above as in the Male, but enter the broad ligament, the Fallopian Tube, the Ovarium and the bottom of the Uterus, & the Hypogastric comes to it from below. The Vagina is sometimes imperforated which is a case easely know: D. H. mentioned a case where the Vagina was grown together after a Venerial injury, & a tumor was formed from the retained menses. She had the Blood let out with the Trochar, but for want of a sufficient opening she relapsed and died from Inflamation. A case after a Miscarriage where the Lady was feverish & after some days there appeared a General Mortification of the Pudenda in spite of all that was done, the Patient sunk and the parts sloughed away from the lower part of the belly to the back behind, after this the Mortification stopped, she grew better and at last quite recovered: the D. shews this whole Vagina in Spirits. The Vessels run across the Uterus anastomosing with one another, & those above with those below.

# Of the Thoracic Viscera.

The Body was divided by the Antients into the lower Cavity or Belly, the Middle Belly or Chest & the Head: At present we have only Belly, Chest & Head. The Chest is divided into fore-part or breast, the Back part & Lateral parts. The situation of the bones of which it is composed is always nearly the same. The Chest is divided from the abdomen by the Diaphragm. The Abdomen is divided externally into several imaginary Regions, but this is not necessary in the best. The Internal parts of y^e^ Chest.

The Pleura is a fine thin Membrane adhering every where to the ribs Intercostal Muscles, united by Cellular Membrane, when this is cut thro' you get into the cavity of the Chest.

The Lungs are in the sides and behind, with the Heart in the middle, tho' these parts are in contact, yet they are loose upon one another. The Diaphragm is convex above & concave below. The Cavity of the Chest is double, right & left without any communication with one another, being divided by the Mediastinum nearly in the middle, tho' rather a little to the left. The Mediastinum is formed by the Pleura being a doubling of that Membrane, like the Peritonæum. It is reflected from one part to another making a complete Bag on each side, so that it covers the Lungs first by adhesion, then loosely where it is connected to the ribs, so that water cannot get out but by Transudation, there being no communication behind or before, for there is just such a Membrane behind as before, with this difference that the posterior Mediastinum leaves room for the Oesophagus & great Artery to pass down.

The